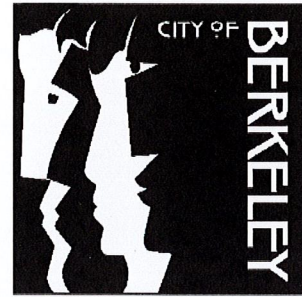


CITY OF BERKELEY

DEPARTMENT OF PARKS, RECREATION,  
AND WATERFRONT  
CAPITAL PROJECTS



# PROJECT MANUAL

## Willard Park Clubhouse & Restroom Replacement

SPECIFICATION NO. 23-11596-C

October, 2023

ADVERTISEMENT DATE: 10/3/2023

PRE-BID CONFERENCE: 10/17/2023

BID OPENING DATE: Thursday, November 2, 2023

Approved by:

A handwritten signature in blue ink, appearing to read 'Scott Ferris', written over a horizontal line.

Scott Ferris

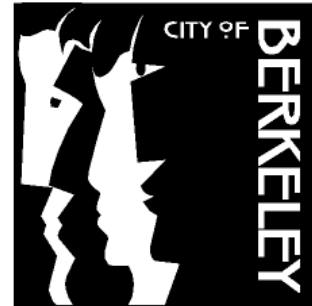
Director of Parks, Recreation and Waterfront





CITY OF BERKELEY

DEPARTMENT OF PARKS,  
RECREATION AND WATERFRONT



# PROJECT MANUAL

Willard Park Clubhouse & Restroom Replacement

at

2720 Hillegass Avenue  
Berkeley, CA 94705

**SPECIFICATION NO. 23-11596-C**  
**October 2023**

Prepared By:

Stacey Rutherford, Associate Civil Engineer

Reviewed By:

Evelyn Chan, Supervising Civil Engineer

**CAPITAL PROJECTS DIVISION**  
**1947 CENTER STREET, 5<sup>TH</sup> FLOOR**  
**BERKELEY, CALIFORNIA 94704**

**Project Manager**  
**Stacey Rutherford, Associate Civil Engineer**  
**Phone: (510) 981-6738**  
**Email: srutherford@berkeleyca.gov**



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**END OF DOCUMENT**

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**DOCUMENT 00 1113****NOTICE INVITING BIDS****ARTICLE 1 - INVITATION TO BID**

- 1.01 Notice Inviting Bids:** City of Berkeley ("City") will receive sealed Bids at City of Berkeley, Purchasing Manager's Office, located at the Martin Luther King Jr. Civic Center, 2180 Milvia Street, Third Floor, Berkeley, CA 94704, Telephone (510) 981-7320, until **2pm, Thursday, November 2, 2023** for the following public work:

**SPECIFICATION NO. 23-11596-C  
CITY OF BERKELEY  
Willard Park Clubhouse & Restroom Replacement  
2720 Hillegass Avenue**

- 1.02 Project Description:** Demolition of the existing, single-story clubhouse, trellis, and public restroom. Construction of a new single-story multi-purpose community building, a stand-alone public restroom and a trash enclosure. Scope includes site work, building core and shell, interior improvements, MEP, fire protection, audio alarm security systems (no CCTV). Work includes ancillary work in accordance with the terms and conditions of the Contract Documents. Work shall be completed within **395** Calendar Days from the date when Contract Time commences to run.
- 1.03 Procurement of Bidding Documents:**  
Bidding Documents contain the full description of the Work. Bidders may obtain Bidding Documents by 2pm, Thursday, November 2, 2023 from City of Berkeley's Public Works website under Current Construction Project Bid Opportunities:  
<https://berkeleyca.gov/doing-business/working-city/bid-proposal-opportunities>  
For information pertaining to the Bidding Documents, please contact the Project Manager, Stacey Rutherford, 1947 Center Street, 5<sup>th</sup> Floor, Berkeley, CA 94704, by Email at [srutherford@berkeleyca.gov](mailto:srutherford@berkeleyca.gov) or by Telephone at (510) 981-6738.
- 1.04 Planholders List:**  
Bidders are responsible for notifying Stacey Rutherford, via email at [srutherford@berkeleyca.gov](mailto:srutherford@berkeleyca.gov) to be included on the Planholders List. Please include the following in the email subject header: "Planholders list for Specification No. 23-11596-C for Willard Park Clubhouse & Restroom Replacement". In the body of the email, please state the Name of the Company Representative, Company Name, Address, Telephone Number, Fax Number, and Email Address.
- 1.05 Instructions:** Bidders shall refer to Document 00 2113 (Instructions to Bidders) for required documents and items to be submitted in a sealed envelope for deposit into the Bid Box, located at **City of Berkeley, Purchasing Manager's Office, Martin Luther King Jr. Civic Center, 2180 Milvia Street, Third Floor, Berkeley, CA 94704, Telephone (510) 981-7320** no later than the time and date set forth in Paragraph 1.01 above.
- 1.06 Non Mandatory Pre-Bid Site Visit:** City will conduct a Non Mandatory Pre-Bid Conference and Site Visit at 2720 Hillegass Avenue. The location of work is partially open to the public during normal business or daylight hours. It is recommended that potential bidders visit the site independently to review site conditions prior to bid. City will conduct a Pre-Bid Conference and Site Visit at 2720 Hillegass Avenue, at 10am, October 17, 2023
- 1.07 Bid Preparation Cost:** Bidders are solely responsible for the cost of preparing their Bids.

- 1.08 Reservation of Rights:** City specifically reserves the right, in its sole discretion, to reject any or all Bids, to re-bid, or to waive inconsequential defects in bidding not involving time, price or quality of the work. City may reject any and all Bids and waive any minor irregularities in the Bids.

## ARTICLE 2 - LEGAL REQUIREMENTS

- 2.01 Required Contractor's License(s):** A California "B" contractor's license is required to bid this contract. Joint ventures must secure a joint venture license prior to award of this Contract. Specialty work may require a specialty contractor's license, held by Bidder or a listed subcontractor.
- 2.02 Bid Alternates:** Bid alternates are identified in Document 00 4113 (Bid Form). The determination of lowest bid shall be based upon: Base contract bid price only.
- 2.03 Substitution of Securities:** City will permit the successful bidder to substitute securities for any retention monies withheld to ensure performance of the contract, as set forth in Document 00 6290 Escrow Agreement For Security Deposits In Lieu Of Retention and incorporated herein in full by this reference, in accordance with Section 22300 of the California Public Contract Code.
- 2.04 Prevailing Wage Laws:** The successful Bidder must comply with all prevailing wage laws applicable to the Project, and related requirements contained in the Contract Documents. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are on file at <http://www.dir.ca.gov/oprl/pwd/> and are deemed included in the Bidding Documents. The successful Bidder shall post the applicable prevailing wage rates at the Site.
- 2.05 Community Workforce Agreement:** This contract **WILL** be subject to the Community Workforce Agreement approved by the Berkeley City Council on June 23, 2015 (See Document 00 6580 – City of Berkeley Contracting Policies). The successful bidder and all subcontractors, at any tier, **WILL** be required to sign an Agreement to be Bound as a condition precedent to entering into any contract for this project.
- 2.06 First Source Construction Agreement:** This contract **WILL NOT** be subject to the First Source Construction Agreement (See Document 00 6580 – City of Berkeley Contracting Policies).
- 2.07** This contract **WILL NOT** be subject to Supplementary Conditions for Federal Funding. Section 00 7201.

**END OF SECTION**

**DOCUMENT 00 2113****INSTRUCTIONS TO BIDDERS**

Bids are requested by City of Berkeley ("City"), for a general construction contract, or work described in general, as set forth in Document 00 1113 (Notice Inviting Bids), and the following additional terms.

**ARTICLE 1 - PROCEDURES FOR SUBMISSION OF BIDS****1.01 Required Pre-Bid Conference and Site Visit**

- A. City **WILL** conduct a Non Mandatory Pre-Bid Conference and Site Visit at 2720 Hillegass Avenue, at 10am, October 17, 2023. The location of work is partially open to the public during normal business or daylight hours. It is recommended that potential bidders visit the site independently to review site conditions prior to bid.
- B. Questions regarding the site and the Bid Documents may be sent to the City's Representative to clarify such matters as Bidders may request. The Site Visit may be the Bidders' only opportunity to investigate conditions at the Site. Other Pre-Bid Site Visits may be scheduled at City's sole discretion, depending on staff availability.
- C. City will issue Minutes of the Pre-Bid Conference, which shall constitute the sole and exclusive record and statement of the results of the Pre-Bid Conference. The Minutes issued by City are not Contract Documents.

**1.02 Required Pre-Bid Investigations**

- A. Prior to submission of Bid, Bidder must conduct a careful examination of Bidding Documents and understand the nature, extent, and location of Work to be performed. Refer to Document 00 7200 (General Conditions) on required pre-bid investigations.
- B. Bidders may examine any available existing conditions information (e.g., record documents, specifications, studies, drawings of previous work), as well as applicable environmental assessment information (if any) regarding the Project, which will be posted on the website location indicated in Document 00 1113 (Notice Inviting Bids), paragraph 1.03.

**1.03 Bidder Questions and Answers**

- A. Bidders must direct all questions about the meaning or intent of Bidding Documents to City's Project Manager in writing as indicated in Document 00 1113 (Notice Inviting Bids), paragraph 1.03. Interpretations or clarifications considered necessary by City in response to such questions will be issued by written Addenda posted to the City's website.
- B. **The deadline for Bidder's questions is Wednesday, October 18, 2023 at 6:00PM.** Questions received less than ten (10) calendar days prior to the date for opening Bids may not be answered.
- C. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect, and Bidders shall not rely on oral statements.

**1.04 Addenda**

- A. Addenda may also be issued to modify the Bidding Documents as deemed advisable by City. Addenda shall be acknowledged by number in Document 00 4113 (Bid Form) and shall be part of the Contract Documents. A complete listing of Addenda may be secured from City on the website as indicated in Document 00 1113 (Notice Inviting Bid), paragraph 1.03.
  1. It is the Contractor's responsibility to check the City's website for Addenda prior to submitting their bid.



**ARTICLE 2 - RECEIPT OF BIDS****2.01** Date and Time

- A. Sealed Bids will be received by the City until the date and time indicated in Document 00 1113 (Notice Inviting Bids). All Bid envelopes will be time-stamped to reflect their submittal time. City shall reject all Bids received after the specified time and will return such Bids to Bidders unopened. Bidders must submit Bids in accordance with this Document 00 2113.

**2.02** Two Envelope Bid Submission:

- A. City will receive Bids in opaque sealed 10 inch x 13 inch envelopes, containing the required items described herein.
- B. Bidders must submit Bids in two envelopes: "Envelope A – Bid Submittals" and "Envelope B – Statement of Qualifications."
- C. Bidders should mark their Bid envelopes using the name, address, identifying information and specification number, indicated in Document 00 1113 (Notice Inviting Bids).

**2.03** Required Contents of "Envelope A – Bid Submittals"

- A. Document 00 4113 (Bid Form). Bidders must submit Bids on Document 00 4113 (Bid Form) in accordance with the provisions of Document 00 4113. Bidders must complete all Bid items and supply all information required by Bid documents and specifications.
- B. Document 00 4313 (Bond Accompanying Bid). Bidders must submit Document 00 4313 (Bond Accompanying Bid) accompanied by a cashier's check, certified check (certified without qualification and drawn on a solvent bank of the State of California or a National Bank doing business in the State of California) or completed form of Document 00 4313 of not less than 10% of the base Bid, payable to City and completed in accordance with the provisions of Document 00 4313.
- C. Document 00 4314 (Bidder Registration and Experience Form). Bidders must submit Document 00 4314 (Bidder Registration and Experience Form), completed in accordance with the provisions of Document 00 4314.
- D. Document 00 4330 (Subcontractor List). Bidders must submit Document 00 4330 (Subcontractors List) completed in accordance with the provisions of Document 00 4330. The Subcontractors List must include the names of all subcontractors for those subcontractors who will perform any portion of work, including labor, rendering of service, or specially fabricating and installing a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent (0.5%) of the total Bid amount. Any violation of this requirement may result in a Bid being deemed non-responsive and not being considered.
- E. Document 00 4519 (Non-Collusion Affidavit). Bidders must submit Document 00 4519 (Non-Collusion Affidavit) completed in accordance with the provisions of Document 00 4519.
- F. Document 00 4546 (Bidder Certifications). Bidders must submit Document 00 4546 (Bidder Certification) completed in accordance with the provisions of Document 00 4546.

**2.04** Required Contents of "Envelope B – Statement of Qualifications"

- A. Document 00 4513 (Statement of Qualifications for Construction Work). Bidder must submit Document 00 4513 (Statement of Qualifications for Construction Work) in accordance with the provisions of Document 00 4513.

**ARTICLE 3 - BID OPENING AND EVALUATION****3.01** Determination of Apparent Low Bidder

- A. City will open each Bidders' Envelope A at the time and place indicated in Document 00 1113 (Notice Inviting Bids), initially evaluate them for responsiveness, and determine an Apparent Low Bidder as specified herein.

- B. Apparent Low Bid will be determined solely on the total amount of all Bid items based on terms contained in Document 00 1113 (Notice Inviting Bids) and Document 00 4113 (Bid Form). All Bidders are required to submit Bids on all Bid items (including any alternates).
- C. For the purposes of award, the apparent low Bidder will be the conforming responsible Bidder offering the lowest total amount for the Total Base Bid shown in the Bid Form. Once the low bidder is determined as herein described, the City reserves the right to award any combination of Additive Bid alternates, or not award any Additive Bid alternates, as it deems to be in the best interest of the City, regardless of whether the total bid of the particular combination selected is higher or lower than any other bidder for that same combination.
- D. For the Apparent Low Bidder only, City will open Envelope B and evaluate the Apparent Low Bidder for responsiveness to the requirements of Document 00 4513 and for Responsibility.
- E. If Apparent Low Bidder is determined to be non-responsive or non-responsible, then City may proceed to the next Apparent Low Bidder's Bid pursuant to any procedures determined in its reasonable discretion, and proceed for all purposes as if this Apparent Low Bidder were the original Apparent Low Bidder.

### **3.02 Evaluation of Bids**

- A. Bids must be full, complete, clearly written and using the required forms. Bidders shall make any change in the Bid by crossing out the original entry, entering and initialing the new entry. Bidder's failure to submit all required documents strictly as required entitles City to reject the Bid as non-responsive. All Bidders must submit Bids containing each of the fully executed documents supplied in this Project Manual.
- B. In evaluating Bids, City will consider Bidders' qualifications, whether or not the Bids comply with the prescribed requirements, unit prices, and other data, as may be requested in Document 00 4113 (Bid Form) or prior to the Notice of Award.
- C. City may conduct reasonable investigations and reference checks of Bidder and other persons and organizations as City deems necessary to assist in the evaluation of any Bid and to establish Bidder's responsibility, qualifications, financial ability and ability to perform the Work in accordance with the Contract Documents to City's satisfaction within the prescribed time. Submission of a Bid constitutes Bidder's consent to the foregoing.
- D. City shall have the right to consider information provided by sources other than Bidder. City shall also have the right to communicate directly with Bidder's surety regarding Bidder's bonds.
- E. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between written words and figures will be resolved in favor of the words.
- F. Bids shall be deemed to include the written responses of the Bidder to any questions or requests for information of City made as part of Bid evaluation process after submission of Bid.

### **3.03 Reservation of Rights**

- A. City reserves the right to reject any or all nonconforming, non-responsive, unbalanced, or conditional Bids, and to reject the Bid of any Bidder as non-responsive as a result of any error or omission in the Bid, or if City believes that it would not be in the best interest of Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by City. For purposes of this paragraph, an "unbalanced Bid" is one having nominal prices for some Bid items and enhanced prices for other Bid items.
- B. City may retain Bid securities and Bid bonds of other than the Apparent Low Bidder for a period of 90 Days after award or full execution of the Contract, whichever first occurs.
- C. City may reject any or all Bids and waive any informalities or minor irregularities in the Bids. City also reserves the right, in its discretion, to reject any or all Bids and to re-Bid the Project.

**ARTICLE 4 - MANDATORY BID PROTEST PROCEDURES****4.01 Submission of Written Bid Protest**

- A. Any Bid protest in connection with the construction contract or work described in general in Document 00 1113 (Notice Inviting Bids) must be submitted in writing to the Project Manager as indicated in Document 00 1113, paragraph 1.03 before 3:30 p.m. of the fifth Business Day following opening of the Bidders' envelopes.
- B. The initial protest document must contain a complete statement of the basis for the protest.
- C. The protest must refer to the specific portion of the document that forms the basis for the protest.
- D. The protest must include the name, address, and telephone number of the person representing the protesting party.
- E. Only Bidders who the City otherwise determines are responsive and responsible are eligible to protest a Bid; protests from any other Bidder will not be considered. In order to determine whether a protesting Bidder is responsive and responsible, City may evaluate all information contained in any protesting Bidder's Bid, and conduct the same investigation and evaluation as City is entitled to take regarding an Apparent Low Bidder.
- F. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

**4.02 Exclusive Remedy**

- A. The procedure and time limits set forth in this paragraph are mandatory and are Bidder's sole and exclusive remedy in the event of Bid protest. Bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings. A Bidder may not rely on a protest submitted by another Bidder, but must timely pursue its own protest.

**ARTICLE 5 - AWARD AND EXECUTION OF CONTRACT****5.01 Notice of Intent to Award and Submittal of Executed Contract Documents**

- A. If Contract is to be awarded, it will be awarded to the lowest responsible responsive Bidder. City will issue Document 00 5100 Notice of Intent to Award. Such Award, if made, will be made within sixty (60) calendar days after the opening of the Bid Proposals.
- B. Successful Bidder must execute and submit to City the "Required Contract Documents and Proof of Insurance" set forth below, by 5:00 p.m. of the 10<sup>th</sup> calendar Day following the Notice of Intent to Award.

**5.02 Required Contract Documents and Proof of Insurance**

- A. Document 00 5200 (Agreement), fully executed by successful Bidder. Submit **two** originals and an emailed PDF, each bearing an original signature (in blue ink) and initials on each page.
- B. Document 00 6113.13 (Construction Performance Bond), fully executed by successful Bidder and surety, in the amount set forth in Document 00 6113.13. Submit **two** originals and an emailed PDF.
- C. Document 00 6113.16 (Construction Labor and Material Payment Bond), fully executed by successful Bidder and surety, in the amount set forth in Document 00 6113.16. Submit **two** originals and an emailed PDF.
- D. Document 00 6536 (Guaranty), fully executed by successful Bidder. Submit **two** originals and an emailed PDF.
- E. Insurance certificates and endorsements required by Document 00 7316 (Supplementary Conditions — Insurance and Indemnification): Submit **one** original set and an emailed PDF.
- F. Document 006580 (City Contracting Policies), fully executed by successful bidder. Submit **one** original set and an emailed PDF.

**5.03 Failure to Execute and Deliver Documents:**

- A. If Bidder to whom Contract is awarded, within the period described in this Document 00 2113, fails or neglects to execute and deliver all required Contract Documents and file all required bonds, insurance certificates, and other documents, City may, in its sole discretion, rescind the award, recover on Bidder's surety bond, or deposit Bidder's cashier's check or certified check for collection, and retain the proceeds thereof as liquidated damages for Bidder's failure to enter into the Contract Documents. Bidder agrees that calculating the damages City may suffer as a result of Bidder's failure to execute and deliver all required Contract Documents would be extremely difficult and impractical and that the amount of Bidder's required Bid security shall be the agreed and presumed amount of City's damages.
- B. Upon such failure to timely deliver all required Contract Documents as set forth herein, City may determine the next Apparent Low Bidder and proceed accordingly. Such Award, if made, will be made within sixty (60) calendar days after the opening of the Bid Proposals.

**ARTICLE 6 - GENERAL CONDITIONS AND REQUIREMENTS****6.01 Modification of Commencement of Work:**

- A. City expressly reserves the right to modify the date for the Commencement of Work under the Contract and to independently perform and complete work related to Project. City accepts no responsibility to Contractor for any delays attributed to its need to complete independent work at the Site.
- B. City shall have the right to communicate directly with Apparent Low Bidder's proposed performance bond surety, to confirm the performance bond. City may elect to extend the time to receive faithful performance and labor and material payment bonds.

**6.02 Conformed Project Manual:**

- A. Following Award of Contract, City may prepare a conformed Project Manual reflecting Addenda issued during bidding, which will, failing objection, constitute the approved Project Manual.

**6.03 Payment Bond:**

- A. If the Project described in Document 00 1113 (Notice Inviting Bids) involves an expenditure in excess of twenty-five thousand dollars (\$25,000), the successful Bidder must file a payment bond with and approved by City prior to entering upon the performance of the Work, in accordance with Civil Code § 3247.

**6.04 Wage Rates:**

- A. The successful Bidder must comply with all prevailing wage laws applicable to the Project, and related requirements contained in the Contract Documents. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are on file at <http://www.dir.ca.gov/oprl/pwd/> and are deemed included in the Bidding Documents. The successful Bidder shall post the applicable prevailing wage rates at the Site.

**6.05 Withdrawal of Bids:**

- A. Bidders may withdraw their Bids at any time prior to the Bid opening time fixed in this Document 00 2113, only by written request for the withdrawal of Bid filed with City's Purchasing Department, at 2180 Milvia Street, 3<sup>rd</sup> Floor, Berkeley, CA 94704. Bidder or its duly authorized representative shall execute request to withdraw Bid.

**6.06 Ineligible Contractors and Subcontractors:**

- A. No contractor or subcontractor may be listed on a bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

- B. City shall not accept a Bid from a Bidder who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code section 1777.1 or 1777.7. Bidders and the Contractor who is awarded the project contract shall not utilize, or allow work by, any subcontractor who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code Section 1777.1 or 1777.7. (See California Public Contract Code Section 6109.) The California Division of Labor Standards Enforcement publishes a list of debarred contractors and subcontractors on the Internet at [www.dir.ca.gov/DLSE/debar.html](http://www.dir.ca.gov/DLSE/debar.html).

**6.07** Substitutions:

- A. Bidders must base their Bids on products and systems specified in Contract Documents or listed by name in Addenda. City will consider substitution requests only for "or equal items." Bidders wanting to use "or equal" item(s) may submit Document 00 6325 (Substitution Request Form) no later than 35 calendar days after Notice of Award. As a limitation on Bidder's privilege to request substitution of "or equal" items, City has found that certain items are designated as City standards and certain items are designated to match existing items in use on a particular public improvement either completed or in the course of completion or are available from one source. As to such items, City will not permit substitution. Such items are described in the Bidding Documents.

**6.08** Definitions:

- A. All abbreviations and definitions of terms used in this Document 00 2113 are set forth in Document 00 7200 (General Conditions) and Section 01 4200 (References and Definitions).

**END OF SECTION**

**DOCUMENT 00 3132****GEOTECHNICAL DATA AND EXISTING CONDITIONS****ARTICLE 1 - REPORTS AND INFORMATION ON EXISTING CONDITIONS****1.01 Inspection of Reports:**

- A. City, its consultants, and prior contractors may have collected documents providing a general description of the Site and conditions of the Work. These documents may consist of geotechnical reports for and around the Site, contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding Underground Facilities (collectively, "Existing Conditions Data".)
- B. Bidders may inspect Geotechnical and Existing Conditions Data. These documents are listed in Section 01 1100 (Summary) and are available for review at the address identified therein. Copies may be obtained for the cost of reproduction and handling upon Bidder's payment for the costs.
- C. Existing Conditions Data is for information only and does not describe labor, materials or equipment furnished by Contractor, but rather, information regarding conditions of the work. Such Existing Conditions Data is not a Contract Document.

**ARTICLE 2 - USE OF EXISTING CONDITIONS DATA****2.01 Above-Ground Existing Conditions:**

- A. City makes no warranty or representation of existing aboveground conditions, as-built conditions, or other aboveground actual conditions verifiable by reasonable independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder must perform prior to bidding and Bidder must not rely on the information supplied by City regarding existing conditions.
- B. Bidder represents and agrees that in submitting its Bid, it is not relying on any information regarding above-ground existing conditions supplied by City.

**2.02 Underground Facilities:**

- A. Information supplied regarding existing Underground Facilities at or contiguous to the Site is based on information furnished to City by others (e.g., the builders of such Underground Facilities or others).
- B. City assumes responsibility for only the general accuracy, completeness or thoroughness of information regarding Underground Facilities that are owned by City. This express assumption of responsibility applies only if Bidder has conducted the independent investigation required of it under Document 00 7200 (General Conditions) and discrepancies were not apparent. Bidder is solely responsible for any interpretation or conclusion drawn from this information.
- C. City is not responsible for information regarding Underground Facilities owned by others.

**2.03 Hazardous Materials Surveys:**

- A. Bidders may rely on this data and information for general accuracy regarding the locations of potentially hazardous materials subject of the Work. City does not warrant and makes no representation regarding the completeness or thoroughness of any data or information regarding existing conditions or hazardous materials, including, but not limited to, quantities, characteristics, volumes, or associated structural features. Bidder represents and agrees that in submitting a Bid it is not relying on any such data, information or deductions.
- B. Data and information regarding the locations of hazardous materials are included in Appendix I for reference only and are not part of Contract Documents.

**2.04 Geotechnical Data:**

- A. Bidder may rely upon the general accuracy of the "technical data" contained in the geotechnical reports and drawings identified above, but only insofar as it relates to subsurface conditions,

provided Bidder has conducted the independent investigation required of it and discrepancies were not apparent.

- B. The term "technical data" shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment, or structures that were encountered during subsurface exploration. The term "technical data" does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures. The term "technical data" shall not include the location of Underground Facilities.
- C. Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder is solely responsible for any interpretation or conclusion drawn from any "technical data" or any other data, interpretations, opinions, or information contained in supplied geotechnical data.
- D. Except as expressly set forth in this Document 00 3132, City does not warrant, and makes no representation regarding, the accuracy or thoroughness of any geotechnical data.
- E. Bidder represents and agrees that in submitting its Bid, it is not relying on any geotechnical data supplied by City, except as specifically set forth herein.

### **ARTICLE 3 - INVESTIGATIONS**

#### **3.01 Required Investigations:**

- A. Before submitting a Bid, each Bidder shall be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site or otherwise, which may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of Contract Documents.
- B. Bidders shall advise City in writing during the Bid period of any questions, suppositions, inferences or deductions Bidders may have for City's review and response.
- C. City has provided time in the period prior to bidding for Bidder to perform these investigations.

#### **3.02 Access to Site for Investigations:**

- A. During the Pre-Bid Site Visit(s), City will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. The Bidder may request alternate dates and times to access the site. Such request must be made in writing at least ten (10) calendar days prior to bid. Bidders must fill all holes and clean up and restore the Site to its former conditions upon completion of such explorations, investigations, tests, and studies. Such investigations may be performed only under the provisions of Document 00 2113 (Instructions to Bidders) and Document 00 7200 (General Conditions) including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such investigation work. Each Bidder shall supply all equipment required to perform any investigations as each Bidder deems necessary. City has the right to limit the number of pieces of machinery operating at one time due to safety concerns.

**END OF SECTION**



**DOCUMENT 00 4113**  
**BID FORM**

**TO CITY OF BERKELEY**

THIS BID IS SUBMITTED BY:

---

(Firm/Company Name)

Re:Willard Park Clubhouse & Restroom Replacement at 2720 Hillegass Avenue, Specification No. 23-11596-C

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with City of Berkeley in the form included in the Contract Documents, Document 00 5200 (Agreement), to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of the Contract Documents.
2. Bidder accepts all of the terms and conditions of the Contract Documents, Document 00 1113 (Notice Inviting Bids), and Document 00 2113 (Instructions to Bidders), including, without limitation, those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for 60 calendar days after the day of Bid opening, unless there is a bid protest, then 90 calendar days after the day of bid opening. Bidder will sign and submit Document 00 5200 (Agreement) and other documents required by Document 002113, paragraph 5.02 (Required Contract Documents and Proof of Insurance) within 20 calendar days after receipt of City’s Notice of Intent to Award.
3. In submitting this Bid, Bidder represents that Bidder has examined all of the Contract Documents, performed all necessary Pre-Bid investigations as set forth in Document 00 5200 (Agreement) Article 6 (Contractor’s Representation), received the Pre-Bid conference minutes (if any), and received the following Addenda:

Addendum Number	ADDENDUM DATE	Signature of Bidder

4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sums of money listed in the following Schedule of Bid Prices:

**SCHEDULE OF BID PRICES**

All Bid items, including lump sums and unit prices, must be filled in completely. Bid items are described in Section 01 1100 (Summary of Work). Quote in figures only, unless words are specifically requested.

ITEM	DESCRIPTION	PRICE (\$)
1	Demolition. This bid item shall include demolition work related to the building and the site as shown in the attached Demolition Permit Plans, specifications and other Contract Documents.	
2	Restroom - All labor, materials, services and equipment necessary for the completion of Work for the restroom, surrounding sitework and utilities as shown in the attached plans, specifications and other Contract Documents, except for that Work called for specifically in other Bid items and other Bid Alternates.	
3	Clubhouse - All labor, materials, services and equipment necessary for the completion of Work for the clubhouse, surrounding sitework and utilities as shown in the attached plans, specifications and other Contract Documents, except for that Work called for specifically in other Bid items and other Bid Alternates.	
4	Fire protection systems. Contractor shall submit fire sprinkler calculations and piping plans, fire alarm (visual and audio) and monitoring/communication system, and exterior storefront system. Contractor shall furnish and install all work, including connections to existing systems.	
5	Solar and battery storage system. Contractor shall furnish and install all work, including connections to other systems.	
<b>Total Bid Price: (Bid Items 1 through 5)</b>		

Total Bid Price: (Bid Items 1 Through 5)

---

(Words)

**(Add) Alternates**

ITEM	DESCRIPTION	PRICE (\$)
1	Add Alternate 1: AV System in community rooms – ceiling speakers, projection screens/video displays, laptop AV connections, simple control system and audio playback for video.	
2	Add Alternate 2: Pollinator garden along Derby Street	

**(Deduct) Alternates**

ITEM	DESCRIPTION	PRICE (\$)
1	Deduct Alternate 1: East Storefront – storefront with double doors in lieu of folding storefront	

5. Subcontractors for work included in all Bid items are listed on Document 00 4330 (Subcontractors List) submitted herewith.
6. The undersigned Bidder understands that City reserves the right to reject this Bid, but that this Bid shall remain open and shall not be withdrawn for a period of sixty (60) calendar days from the date prescribed for its opening.
7. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Intent to Award, is mailed or delivered to the undersigned Bidder within the time described in Paragraph 2 of this Document 00 4113 or at any other time thereafter before it is withdrawn, the undersigned Bidder will execute and deliver the documents required by Document 00 2113 (Instructions to Bidders) within the times specified therein.
8. Notice of Award or request for additional information may be addressed to the undersigned Bidder at the address set forth below.
9. The undersigned Bidder herewith encloses cash, a cashier's check, or certified check of or on a responsible bank in the United States, or a corporate surety bond furnished by a surety authorized to do a surety business in the State of California, in form specified in Document 00 2113 (Instructions to Bidders), in the amount of ten percent (10%) of the Total Bid Price and made payable to City of Berkeley.
10. The undersigned Bidder agrees to commence Work under the Contract Documents on the date established in Document 00 7200 (General Conditions) and to complete all Work within the time specified in Document 00 5200 (Agreement).
11. The undersigned Bidder agrees that, in accordance with Document 00 7200 (General Conditions), liquidated damages for failure to complete all Work in the Contract within the time specified in Document 00 5200 (Agreement) shall be as set forth in Document 00 5200.
12. The names of all persons interested in the foregoing Bid as principals are:

**IMPORTANT NOTICE:**

If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full.

**NAME OF BIDDER:** \_\_\_\_\_

licensed in accordance with an act for the registration of Contractors, and with license number: \_\_\_\_\_ Expiration: \_\_\_\_\_.

\_\_\_\_\_  
(Place of Incorporation, if Applicable) (Principal)

\_\_\_\_\_  
(Principal)

\_\_\_\_\_  
(Principal)

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

\_\_\_\_\_  
(Signature of Bidder)

**NOTE:** If Bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If Bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

Business Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Contractor's Representative(s): \_\_\_\_\_  
(Name/Title)

\_\_\_\_\_  
(Name/Title)

\_\_\_\_\_  
(Name/Title)

Officers Authorized to Sign Contracts \_\_\_\_\_  
(Name/Title)

\_\_\_\_\_  
(Name/Title)

\_\_\_\_\_  
(Name/Title)

Telephone Number(s):

\_\_\_\_\_  
(Area Code) (Number)

\_\_\_\_\_  
(Area Code) (Number)

Fax Number(s):

\_\_\_\_\_  
(Area Code) (Number)

\_\_\_\_\_  
(Area Code) (Number)

Date of Bid:

\_\_\_\_\_

**END OF SECTION**

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**DOCUMENT 00 4313**  
**BOND ACCOMPANYING BID**

KNOW ALL BY THESE PRESENTS:

That the undersigned

\_\_\_\_\_  
(Name of Contractor)

as Principal and the undersigned as Surety are held and firmly bound unto City of Berkeley,  
as obligee, in the penal sum of \_\_\_\_\_

(Dollar Amount in Words)

Dollars (\$ \_\_\_\_\_) lawful money of the United States of America being at least ten  
percent (10%) of the aggregate amount of said Principal

\_\_\_\_\_’s base Bid, for the payment of which,  
well and truly to be made, we bind ourselves, our successors, executors, administrators, and assigns,  
jointly and severally, firmly by these presents.

WHEREAS, the said Principal is submitting a Bid for

Specification No. 23-11596-C  
**Willard Park Clubhouse & Restroom Replacement**  
at 2720 Hillegass Avenue.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Bid submitted by the said Principal  
be accepted and the Contract be awarded to said Principal and said Principal shall within the required  
periods enter into the Contract so awarded and provide the required Construction Performance Bond,  
Construction Labor and Material Payment Bond, insurance certificates, Guarantee, and all other  
endorsements, forms, and documents required under Document 00 2113 (Instructions to Bidders), then  
this obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument this \_\_\_\_\_  
day of \_\_\_\_\_, 20\_\_\_\_.  
(Month)

(Corporate Seal)

By \_\_\_\_\_  
Principal

By \_\_\_\_\_  
Surety

(Corporate Seal)

By \_\_\_\_\_  
Attorney in Fact

**END OF SECTION**

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**DOCUMENT 00 4314**  
**BIDDER REGISTRATION FORM**  
**INSTRUCTIONS**

In order to register to undertake work for City of Berkeley, Bidder **must**:

- 1) Fill out this registration form completely; do not leave blanks.
- 2) Provide certificates of insurance or a letter evidencing coverage complying with Document 00 4513 (Statement of Qualifications).

**INDEPENDENT CONTRACTOR REGISTRATION**

Contractor's License # \_\_\_\_\_

Date: \_\_\_\_\_ Fed I.D. # \_\_\_\_\_

Full Corporate Name of Company: \_\_\_\_\_

Street Address: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Name of Principal Contact: \_\_\_\_\_

Type of Business:                      \_\_\_\_\_ Sole Proprietor                      \_\_\_\_\_ Partnership  
    \_\_\_\_\_ Non-Profit 501(c)(3)                      \_\_\_\_\_ Corporation  
    \_\_\_\_\_ other (please explain: \_\_\_\_\_ )

**INSURANCE**

**Workers' Compensation:**

Carrier: \_\_\_\_\_

Address: \_\_\_\_\_

Phone and Fax: \_\_\_\_\_

Policy Number: \_\_\_\_\_

**General Liability:**

Carrier: \_\_\_\_\_

Address: \_\_\_\_\_

Phone and Fax: \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Limits: \$ \_\_\_\_\_

A.M. Best Rating: \_\_\_\_\_

**Automobile Liability:**

Carrier: \_\_\_\_\_

Address: \_\_\_\_\_

Phone and Fax: \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Limits: \$ \_\_\_\_\_

A.M. Best Rating: \_\_\_\_\_

**All-risk Course of Construction (if applicable, as required by Document 00 7316 [Supplementary Conditions – Insurance]):**

Carrier: \_\_\_\_\_

Address: \_\_\_\_\_

Phone and Fax: \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Limits: \$ \_\_\_\_\_

A.M. Best Rating: \_\_\_\_\_

**Professional Liability (if applicable, as required by Document 00 7316 [Supplementary Conditions – Insurance]):**

Carrier: \_\_\_\_\_

Address: \_\_\_\_\_

Phone and Fax: \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Limits: \$ \_\_\_\_\_

A.M. Best Rating: \_\_\_\_\_

**Pollution Legal Liability Insurance (if applicable, as required by Document 00 7316  
[Supplementary Conditions – Insurance]):**

Carrier: \_\_\_\_\_

Address: \_\_\_\_\_

Phone and Fax: \_\_\_\_\_

Policy Number: \_\_\_\_\_

Policy Limits: \$ \_\_\_\_\_

A.M. Best Rating: \_\_\_\_\_

**BIDDER CERTIFIES, UNDER PENALTY OF PERJURY, THAT THE FOREGOING  
INFORMATION IS CURRENT AND ACCURATE AND AUTHORIZES OWNER, AND ITS AGENTS AND  
REPRESENTATIVES TO OBTAIN A CREDIT REPORT AND/OR VERIFY ANY OF THE ABOVE  
INFORMATION.**

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE

**SAFETY EXPERIENCE**

The following statements as to the Bidder's safety experience are submitted with the Bid, as part thereof, and the Bidder guarantees the truthfulness and accuracy of all information.

1. List Bidder's interstate Experience Modification Rate for the last three years.

[20\_] \_\_\_\_\_ [20\_] \_\_\_\_\_ [20\_] \_\_\_\_\_

2. Use Bidder's last year's Cal/OSHA 200 log to fill in the following number of injuries and illnesses:

a. Number of lost workday cases \_\_\_\_\_

b. Number of medical treatment cases \_\_\_\_\_

c. Number of fatalities \_\_\_\_\_

3. Employee hours worked last year \_\_\_\_\_

4. State the name of Bidder's safety engineer/manager:

Attach a resume or outline of this individual's safety and health qualifications and experience.

**I CERTIFY, UNDER PENALTY OF PERJURY, THAT THE FOREGOING INFORMATION IS CURRENT AND ACCURATE AND I AUTHORIZE OWNER, AND ITS AGENTS AND REPRESENTATIVES TO OBTAIN A CREDIT REPORT AND/OR VERIFY ANY OF THE ABOVE INFORMATION.**

**BIDDER:**

By: \_\_\_\_\_  
Signature

Its: \_\_\_\_\_  
Title

Date \_\_\_\_\_

**END OF SECTION**

**DOCUMENT** Error! Unknown document property name.

**SUBCONTRACTORS LIST**

Bidder submits the following information as to the subcontractors Bidder intends to employ if awarded the Contract.

Full Name of Subcontractor (Sub.) and Address of Mill or Shop	Sub.'s License No.	Description of Work: Reference to Bid Items	Sub.'s Bid Amount	Sub.'s Depart. Of Industrial Relations No.

(Bidder to attach additional sheets if necessary)

**END OF SECTION**

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**DOCUMENT 00 4513**  
**STATEMENT OF QUALIFICATIONS FOR CONSTRUCTION PROJECTS**

**ARTICLE 1 – GENERAL INFORMATION****1.01 Minimum Bidder Qualifications.**

- A. Bidders must be duly licensed in accordance with the California Business & Professions Code and have a history of work performance sufficient to meet the requirements of a responsible bidder in the California Public Contract Code Section 1104.
- B. Bidders must have three (3) years experience as a continuously operating entity engaged in the performance of similar work.
- C. Bidders must demonstrate successful experience with type of work of this Project, to include, within the past three (3) years, completed three (3) projects of a similar nature and complexity with a contract dollar amount of (i.) at least 75% of the amount of Bidder's Bid or (ii.) 125% of such amount in the aggregate.

**1.02 Measurement.**

- A. Bidder's compliance with the minimum qualification requirements will be measured by Bidder's experience as an operating entity and also by the experience of the supervisory personnel who will have responsible charge of the various major components of the Work.
- B. If Bidder subcontracts portions of the Work, City, in its determination of whether the minimum qualification requirements have been met, may consider the qualifications of the Subcontractor's supervisory personnel.
- C. The qualifications of the Key Personnel are to be submitted with the Statement of Qualifications ("SOQ"), by providing the information described in this Document 00 4513.

**ARTICLE 2 – Required Contents of SOQ Submission****2.01 Transmittal Letter**

- A. The Transmittal Letter shall name the proposed prime contractor, its legal structure (i.e., corporation, partnership, limited partnership, joint venture). If a joint venture or partnership is proposed, Bidder shall identify partner and/or member of the joint venture and their roles and responsibilities.

**2.02 Submittals:**

- A. Completed Questionnaire. Bidder shall include a completed Statement of Qualification Questionnaire in the form attached to this Document 00 4513 as Attachment "A".
- B. License: Evidence of a valid contractor's license and required licenses of all licensees of persons who are Key Personnel necessary to perform the Work.
- C. Litigation History. Description of litigation history for the past three years, including names of involved parties, nature of dispute, and disposition.

**2.03 Additional Submittals:**

After bid opening, Contractor maybe required to supply the City with the following submittals upon request.

- A. Resumes of Proposed Key Personnel. Bidder shall provide a resume for each named Key Personnel of Bidder, to include as necessary: Years of experience; Education - degrees, schools and years obtained; Professional Registrations; Fluency in English (Yes/No); At least two client references, including contact names, addresses and telephone numbers, and description of projects of a similar nature worked on in the past five years.
- B. Audited or Reviewed Financial Statements. Include audited or reviewed financial statements for the three most recently completed fiscal years for Bidder and each member of any proposed

consorting or joint venture. Also include audited or reviewed financial statements for the three most recently completed fiscal years for any parent companies) of Bidder and each member of any proposed consortium or joint venture.

- C. Surety Letter re: Capability to Provide Required Performance and Payment Bonds. Bidder shall include a letter from a surety duly licensed to do business in the State of California, having a financial rating from A.M. Best Company of A-, VIII or better, that the surety has agreed to provide Bidder with the required performance and payment bonds in accordance with the requirements set forth in Documents 00 6113.13 (Construction Performance Bond) and 00 6113.16 (Construction Labor and material Payment bond), each in the penal sum of the Contractor's bid when submitted. Owner shall have the right to verify with the surety that the surety, based upon the Bid prices, will issue the required bonds under the conditions stated.
- D. Insurer Letter re: Capability to Provide the Required Insurance. Bidder shall provide a letter from an insurance underwriter, having a financial rating reasonably acceptable to City, confirming that the insurer will provide Bidder the required coverages and amounts specified in the Contract Documents.
- E. Description of Human and Physical Resources. Bidder shall identify, describe, and quantify for itself, the following technical information for the construction work: Description and location of manufacturing facilities, naming products and quantifying production capacity and current demand; Description of field organization(s), naming skills and equipment; Description of safety program quality control procedures, and safety experience.

#### **2.04 Format.**

- A. The SOQ shall be clear and concise to enable management-oriented personnel to make a thorough evaluation and arrive at a sound determination as to whether the SOQ meet City's requirement. To this end, the SOQ should be so specific, detailed and complete as to demonstrate clearly and fully that the Bidder has a thorough understanding of and has demonstrated knowledge of the requirements to perform the Work (or applicable portion thereof).
- B. Any explanation requested by a Bidder regarding the meaning or interpretation of this Document 00 4513 must be requested in writing and with sufficient time allowed for a reply to reach Bidder before the submission of its SOQ. Oral explanations or instructions will not be binding. Any information provided to any prospective Bidder concerning this Document 00 4513 will be furnished to all prospective Bidders as an Addendum to the Bidding Documents.

STATEMENT OF QUALIFICATION QUESTIONNAIRE FOLLOWS ON NEXT PAGE



**ATTACHMENT "A" – STATEMENT OF QUALIFICATION QUESTIONNAIRE**

Bidders shall complete the entire Statement of Qualification Questionnaire and submit it in accordance with Document 00 2113 (Instructions to Bidders) and Document 00 4513 (Statement of Qualifications). Failure to complete the questionnaire or inclusion of any false statement(s) shall be ground for immediate disqualification.

**CONTACT INFORMATION**

Company Name: \_\_\_\_\_

Owner of Company: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

**PART A: GENERAL INFORMATION**

1. Does Bidder possess a valid and current California Contractor's license for the work proposed? Yes \_\_\_ No \_\_\_
2. Does Bidder have a minimum of **\$2,000,000** liability insurance coverage? Yes \_\_\_ No \_\_\_
3. Has Bidder's License been revoked at any time in the last five years? Yes \_\_\_ No \_\_\_
4. Has Bidder been "default terminated" by an Owner (other than for convenience), or has a Surety completed a contract for Bidder within the last five years? Yes \_\_\_ No \_\_\_
5. Has Bidder been convicted more than twice for failure to pay prevailing wages in the last three years? Yes \_\_\_ No \_\_\_
6. Will Bidder provide copies of its reviewed or audited financial statements and accompanying notes for the last three years, if requested? Yes \_\_\_ No \_\_\_

**Bidder may be disqualified if any answer to questions 1, 2, or 6 is No.  
 Bidder may be disqualified if any answer to questions 3, 4, or 5 is Yes.**

**PART B: SAFETY, PREVAILING WAGE, DISPUTES AND BONDS**

**(SAFETY)**

1. Has Cal/OHSA, Federal OSHA, the EPA or any Air Quality Management Owner cited Bidder in the past five years?  
 Yes \_\_\_ No \_\_\_ If yes, attach description of each citation.
2. How often does Bidder require documented safety meetings be held for:
 

Field Supervisor	Weekly _____	Bi-Weekly _____	Monthly _____	Less Than Monthly _____
Employees	Weekly _____	Bi-Weekly _____	Monthly _____	Less Than Monthly _____
New Hires	Weekly _____	Bi-Weekly _____	Monthly _____	Less Than Monthly _____
Subcontractors	Weekly _____	Bi-Weekly _____	Monthly _____	Less Than Monthly _____
3. How often does Bidder conduct documented safety inspections?  
 Quarterly \_\_\_\_\_ Semi-annually \_\_\_\_\_ Annually \_\_\_\_\_ Other \_\_\_\_\_

- 4. Does Bidder have home office safety representatives who visit/audit the job site?  
Quarterly \_\_\_\_\_ Semi-annually \_\_\_\_\_ Annually \_\_\_\_\_ Other \_\_\_\_\_
- 5. What is Bidder's Interstate Experience Modification Rate? \_\_\_\_\_. (A rating in excess of **[1]** may constitute grounds for disqualification as non-responsible).

**(PREVAILING WAGE PROVISIONS)**

- 6. Has Bidder been fined, penalized or otherwise found to have violated any prevailing wage or labor code provision? If yes, attach description of each occurrence.  
Yes \_\_\_\_\_ No \_\_\_\_\_

**(LICENSE PROVISIONS)**

- 7. Has Bidder changed names or license numbers in the past 5 years? If so, please state reason for change.  
Yes \_\_\_\_\_ No \_\_\_\_\_ Reason: \_\_\_\_\_  
\_\_\_\_\_

**(DISPUTES)**

- 8. Has Bidder had any claims, litigation, or disputes ending in mediation or arbitration, or termination for cause associated with any project in the past 5 years? If yes, attach description of each instance including details of total claim amount, settlement amount, and Owner's name and phone number.  
Yes \_\_\_\_\_ No \_\_\_\_\_

**(BONDING)**

- 9. Bonding Capacity – Provide documentation from Bidder's surety identifying the following:  
Name of bonding company/surety: \_\_\_\_\_  
Name of Surety Agent: \_\_\_\_\_  
Surety Agent address: \_\_\_\_\_  
Surety Agent phone number: \_\_\_\_\_  
Is surety a California-admitted surety? Yes \_\_\_\_\_ No \_\_\_\_\_  
Is surety listed in the current edition of the California Department of the Treasury's Listing of approved sureties? Yes \_\_\_\_\_ No \_\_\_\_\_  
List surety's A.M. Best Rating: \_\_\_\_\_  
What is Bidder's total bonding capacity? \_\_\_\_\_  
What percent does Bidder pay for bonds? \_\_\_\_\_

**PART C: EXPERIENCE OF PRIME CONTRACTOR**

The nature of this Project requires prior similar experience for the firm and the Key Personnel assigned. Summarize similar project experience below and provide the detailed project information requested:

**Prime Contractor.** List three projects of similar size and scope to the Work of the Contract, completed in the past three (3) years, and indicate who were the superintendent, project manager and scheduler.

NOTE: this listing will be used to assess compliance with the stated minimum qualifications in Section 1.01.

Project Name	Construction Cost (\$)	Year Completed	Name of Project Superintendent	Name of Project Manager	Name of Project Scheduler

List Key Personnel that will be assigned to the Work of the current Project and their experience/training with the projects listed above:

Project Manager: \_\_\_\_\_

Project Superintendent: \_\_\_\_\_

Project Scheduler: \_\_\_\_\_

**Recent Projects.**

Provide information about three (3) of its most currently completed projects. Names and references must be current and verifiable. This listing will be used to assess compliance with the stated minimum qualifications in Section 1.01. If a separate sheet is used, it must contain all of the following information:

1. Project Name: \_\_\_\_\_  
 Location: \_\_\_\_\_  
 Owner: \_\_\_\_\_  
 Owner Contact (name and phone): \_\_\_\_\_  
 Architect/Engineer: \_\_\_\_\_  
 Architect/Engineer Contact (name and phone number): \_\_\_\_\_  
 Const. Mgr. or Project Mgr. (name and phone number): \_\_\_\_\_  
 Description of Project, Scope of Work Performed: \_\_\_\_\_  
 \_\_\_\_\_  
 Total Construction Cost: \_\_\_\_\_  
 Total Change Order Amount: \_\_\_\_\_  
 Did Change Orders exceed 10% of original contract sum? \_\_\_\_\_ If yes, please explain on separate sheet.  
 Original Scheduled Date of Completion: \_\_\_\_\_  
 Time Extensions Granted (number of calendar days): \_\_\_\_\_  
 Actual Date of Completion: \_\_\_\_\_  
 Number of Stop Notices filed by Subcontractors or Suppliers: \_\_\_\_\_
  
2. Project Name: \_\_\_\_\_  
 Location: \_\_\_\_\_  
 Owner: \_\_\_\_\_  
 Owner Contact (name and phone): \_\_\_\_\_  
 Architect/Engineer: \_\_\_\_\_  
 Architect/Engineer Contact (name and phone number): \_\_\_\_\_  
 Const. Mgr. or Project Mgr. (name and phone number): \_\_\_\_\_  
 Description of Project, Scope of Work Performed: \_\_\_\_\_  
 \_\_\_\_\_

Total Construction Cost: \_\_\_\_\_

Total Change Order Amount: \_\_\_\_\_

Did Change Orders exceed 10% of original contract sum? \_\_\_\_\_ If yes, please explain on separate sheet.

Original Scheduled Date of Completion: \_\_\_\_\_

Time Extensions Granted (number of calendar days): \_\_\_\_\_

Actual Date of Completion: \_\_\_\_\_

Number of Stop Notices filed by Subcontractors or Suppliers: \_\_\_\_\_

3. Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Owner: \_\_\_\_\_

Owner Contact (name and phone): \_\_\_\_\_

Architect/Engineer: \_\_\_\_\_

Architect/Engineer Contact (name and phone number): \_\_\_\_\_

Const. Mgr. or Project Mgr. (name and phone number): \_\_\_\_\_

Description of Project, Scope of Work Performed: \_\_\_\_\_

\_\_\_\_\_

Total Construction Cost: \_\_\_\_\_

Total Change Order Amount: \_\_\_\_\_

Did Change Orders exceed 10% of original contract sum? \_\_\_\_\_ If yes, please explain on separate sheet.

Original Scheduled Date of Completion: \_\_\_\_\_

Time Extensions Granted (number of calendar days): \_\_\_\_\_

Actual Date of Completion: \_\_\_\_\_

Number of Stop Notices filed by Subcontractors or Suppliers: \_\_\_\_\_

**PART D: FINANCIAL INFORMATION**

1. Has Bidder ever reorganized under the protection of bankruptcy laws?

Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, please state when \_\_\_\_\_

2. If Bidder has had the general liability carrier identified in Document 00 4314 (Bidder Registration and Safety Experience Form) for less than 5 years, please provide additional information below for balance of the last 5 years:

Agency Name: \_\_\_\_\_

Contact Name: \_\_\_\_\_

Phone Number \_\_\_\_\_

Carrier: \_\_\_\_\_ A.M. Best Rating: \_\_\_\_\_

Carrier: \_\_\_\_\_ A.M. Best Rating: \_\_\_\_\_

Carrier: \_\_\_\_\_ A.M. Best Rating: \_\_\_\_\_

3. Has Bidder ever had insurance terminated by a carrier? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, explain on a separate signed sheet marked with correlating cross-reference to this paragraph of the questionnaire.

Bidder hereby declares under penalty of perjury that all the information provided in this questionnaire is true and correct.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
TITLE

**END OF SECTION**

**DOCUMENT 00 4519**  
**NON-COLLUSION AFFIDAVIT**

PUBLIC CONTRACT CODE §7106

NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

STATE OF CALIFORNIA                    )  
  ) ss.  
COUNTY OF \_\_\_\_\_)

\_\_\_\_\_, being first duly sworn,  
(Name of Principal of Bidder)

deposes and says that he or she is \_\_\_\_\_  
(Office of Affiant)

of \_\_\_\_\_, the party  
(Name of Bidder)

making the foregoing Bid, that the Bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the Bid is genuine and not collusive or sham; that Bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham Bid, and has not directly or indirectly colluded, conspired, connived or agreed with any bidder or anyone else to put in a sham Bid, or that anyone shall refrain from bidding, and that the Bidder has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the Bid price of Bidder or any other bidder, or to fix any overhead, profit or cost element of the Bid price, or of that of any other bidder, or to secure any advantage against City, or anyone interested in the proposed contract; that all statements contained in the Bid are true; and further, that Bidder has not, directly or indirectly, submitted its Bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, Bid depository, or to any member or agent thereof to effectuate a collusive or sham Bid.

Executed under penalty of perjury under the laws of the State of California:

\_\_\_\_\_  
(Name of Bidder)

\_\_\_\_\_  
(Signature of Principal)

Subscribed and sworn before me \_\_\_\_\_

This \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

Notary Public of the State of \_\_\_\_\_

In and for the County of \_\_\_\_\_

My Commission expires \_\_\_\_\_

(Seal)

**NOTE:** If Bidder is a partnership or a joint venture, this affidavit must be signed and sworn to by every member of the partnership or venture.

**NOTE:** If Bidder [including any partner or venturer of a partnership or joint venture] is a corporation, this affidavit must be signed by the Chairman, President, or Vice President and by the Secretary, Assistant Secretary, Chief Financial Officer, or Assistant Treasurer.

**NOTE:** If Bidder's affidavit on this form is made outside the State of California, the official position of the person taking such affidavit shall be certified according to law.

**END OF SECTION**



**DOCUMENT 00 4546**

**BIDDER CERTIFICATIONS**

TO BE EXECUTED BY ALL BIDDERS AND SUBMITTED WITH BID

The undersigned Bidder certifies to City as set forth in sections 1 through 5 below.

**1. STATEMENT OF CONVICTIONS**

By my signature hereunder, I hereby swear, under penalty of perjury, that no more than one final, unappealable finding of contempt of court by a Federal Court has been issued against Bidder within the past two years because of failure to comply with an order of a Federal Court or to comply with an order of the National Labor Relations Board.

**2. CERTIFICATION OF WORKER'S COMPENSATION INSURANCE**

By my signature hereunder, as the Contractor, I certify that I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this Contract.

**3. CERTIFICATION OF PREVAILING WAGE RATES AND RECORDS**

By my signature hereunder, as the Contractor, I certify that I am aware of the provisions of Section 1773 of the California Labor Code, which requires the payment of prevailing wage on public projects. Also, that the Contractor and any subcontractors under the Contractor shall comply with California Labor Code §1776, regarding wage records, and with California Labor Code §1777.5, regarding the employment and training of apprentices. It is the Contractor's responsibility to ensure compliance by any and all subcontractors performing work under this Contract.

**4. CERTIFICATION OF COMPLIANCE WITH PUBLIC WORKS CHAPTER OF LABOR CODE**

By my signature hereunder, as the Contractor, I certify that I am aware of Sections 1777.1 and 1777.7 of the California Labor Code and Contractor and Subcontractors and am eligible to bid and work on public works projects.

**5. CERTIFICATION OF ADEQUACY OF CONTRACT AMOUNT**

By my signature hereunder, as the Contractor, pursuant to Labor Code Section 2810(a), I certify that, if awarded the Contract based on the undersigned's Bid, the Contract will include funds sufficient to allow the Contractor to comply with all applicable local, state, and federal laws or regulations governing the labor or services to be provided. I understand that Owner will be relying on this certification if it awards the Contract to the undersigned.

**BIDDER:**

\_\_\_\_\_  
(Name of Bidder)

Date: \_\_\_\_\_, [20 ] By: \_\_\_\_\_  
(Signature)

Name: \_\_\_\_\_  
(Print Name)

Its: \_\_\_\_\_  
(Title)

**END OF SECTION**

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**DOCUMENT 00 5100****NOTICE OF INTENT TO AWARD**

Dated \_\_\_\_\_

TO: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CONTRACT NO.: \_\_\_\_\_

CONTRACT FOR: City of Berkeley  
**Willard Park Clubhouse & Restroom Replacement AT 2720 Hillegass Avenue**

The Contract Sum of your contract is \_(\$)\_.

1. Two copies of the proposed Contract Documents listed below accompany this Notice of Award.
2. You must comply with the following conditions precedent by **5:00 p.m.** of the **20<sup>th</sup> Day** following the date of this Notice of Award, that is, by .
  - a. Deliver to Owner **two** fully executed counterparts and an emailed PDF copy of Document 00 5200 (Agreement). Each copy of Document 00 5200 (Agreement) must bear your original signature on the signature page and your initials on each page.
  - b. Deliver to Owner **two** originals and an emailed PDF of Document 00 6113.13 (Construction Performance Bond), executed by you and your surety.
  - c. Deliver to Owner **two** originals and an emailed PDF of Document 00 6113.16 (Construction Labor and Material Payment Bond), executed by you and your surety.
  - d. Deliver to Owner **two** original copies and an emailed PDF of Document 00 6536 (Guaranty), each executed by you.
  - e. Deliver to Owner **one** original set and an emailed PDF of the insurance certificates with endorsements required under Document 00 7316 (Supplementary Conditions – Insurance).
  - f. Deliver to Owner **one** original copy and an emailed PDF of all documents found in Document 00 6580 (City of Berkeley Contracting Policies) executed by you.
3. Failure to comply with these conditions within the time specified will entitle Owner to consider your Bid abandoned, to annul this Notice of Award, and to declare your Bid security forfeited.
4. Within 21 calendar days after you comply with the conditions in Paragraph 2 of this Document 00 5100, Owner will return to you one fully signed counterpart of Document 00 5200 (Agreement) with [number] copies of the Project Manual (including Specifications and Drawings) and [number] sets of full-size Drawings.
5. Before you may start any Work at the Site, you must attend a preconstruction conference. The preconstruction conference may be arranged through **Stacey Rutherford (510) 981-6738**. Questions

regarding bonds and insurance may be directed to **Stacey Rutherford** at the same number. All other inquiries regarding the Project should be directed to **Stacey Rutherford**.

6. Upon commencement of the Work, you and each of your Subcontractors shall certify and provide Owner copies of payroll records on forms provided by the Division of Labor Standards Enforcement, in accordance with California Labor Code §1776.

**OWNER**

BY: \_\_\_\_\_  
(Title)

\_\_\_\_\_  
( Print Name)

ATTEST: \_\_\_\_\_  
Secretary

\_\_\_\_\_  
(Print Name)

AUTHORIZED BY [CITY / COUNTY / DISTRICT] RESOLUTION:

NO: \_\_\_\_\_

ADOPTED: \_\_\_\_\_, [20\_\_]

**[Copy of Resolution Attached]**

**END OF DOCUMENT**

**DOCUMENT 00 5200**

**AGREEMENT**

THIS AGREEMENT, dated this [date] day of [Month], [20\_\_], by and between whose place of business is located at ("Contractor"), and **City of Berkeley** ("City"), acting under and by virtue of the authority vested in Owner by the laws of the State of California.

**SPECIFICATION NUMBER 23-11596-C**

**Willard Park Clubhouse & Restroom Replacement  
at  
2720 Hillegass Avenue**

NOW, THEREFORE, in consideration of the mutual covenants hereinafter set forth, Contractor and City agree as follows:

**ARTICLE 1 – SCOPE OF WORK OF THE CONTRACT**

**1.01 WORK OF THE CONTRACT**

- A. Contractor shall complete all Work specified in the Contract Documents, in accordance with the Specifications, Drawings, and all other terms and conditions of the Contract Documents (**Work**).

**1.02 PRICE FOR COMPLETION OF THE WORK**

- A. City shall pay Contractor the following Contract Sum for completion of Work in accordance with Contract Documents as follows:

---

[HERE INSERT LUMP SUM, UNIT PRICES, OR CONTRACTOR'S BID IN WORDS AND NUMBERS]

- B. The Contract Sum includes all allowances (if any).

**ARTICLE 2 – COMMENCEMENT AND COMPLETION OF WORK**

**2.01 COMMENCEMENT OF WORK**

- A. Contractor shall commence Work on the date established in the Notice to Proceed (**Commencement Date**).
- B. City reserves the right to modify or alter the Commencement Date.

**2.02 COMPLETION OF WORK**

- A. Contractor shall achieve Substantial Completion of the entire Work within **395** calendar days from the Commencement Date.
- B. Contractor shall achieve Final Completion of the entire Work **425** calendar days from the Commencement Date.

**ARTICLE 3 – PROJECT REPRESENTATIVES**

**3.01 CITY'S PROJECT MANAGER**

- A. City has designated Stacey Rutherford as its Project Manager to act as City's Representative in all matters relating to the Contract Documents.
- B. Project Manager shall have final authority over all matters pertaining to the Contract Documents

and shall have sole authority to modify the Contract Documents on behalf of City, to accept work, and to make decisions or actions binding on City, and shall have sole signature authority on behalf of City.

- C. City may assign all or part of the Project Manager’s rights, responsibilities and duties to a Construction Manager, or other City Representative.

**3.02 CONTRACTOR’S PROJECT MANAGER**

- A. Contractor has designated [\_\_\_\_\_ or other] as its Project Manager to act as Contractor’s Representative in all matters relating to the Contract Documents.

**3.03 ARCHITECT/ENGINEER**

- A. **ELS Architecture + Urban Design** furnished the Plans and Specifications and shall have the rights assigned to Architect/Engineer in the Contract Documents.
- B. Architect/Engineer has designated **Dana Bazzi** as its project manager, to act as its representative for receiving and making communications authorized under the Contract Documents.

**ARTICLE 4 – LIQUIDATED DAMAGES FOR DELAY IN COMPLETION OF WORK**

**4.01 LIQUIDATED DAMAGE AMOUNTS**

- A. As liquidated damages for delay, Contractor shall pay City two thousand five hundred dollars (\$2,500.00) for each Day that expires after the time specified herein for Contractor to achieve Substantial Completion of the entire Work, until achieved.
- B. As liquidated damages for delay, Contractor shall pay City two thousand five hundred dollars (\$2,500.00) for each Day that expires after the time specified herein for Contractor to achieve Final Completion of the entire Work, until achieved.

**4.02 SCOPE OF LIQUIDATED DAMAGES**

- A. Measures of liquidated damages shall apply cumulatively.
- B. Limitations and stipulations regarding liquidated damages are set forth in Document 00 7200 (General Conditions).

**ARTICLE 5 – CONTRACT DOCUMENTS**

- 5.01** Contract Documents consist of the following documents, including all changes, Addenda, and Modifications thereto:

Document 00 5100	Notice of Award
Document 00 5200	Agreement
Document 00 5500	Notice to Proceed
Document 00 6113.13	Construction Performance Bond
Document 00 6113.16	Construction Labor and Material Payment Bond
Document 00 6536	Guaranty
Document 00 6530	Release of Claims
Document 00 6325	Substitution Request Form
Document 00 6290	Escrow Agreement for Security Deposits
Document 00 6580	City of Berkeley Contracting Policies
Document 00 7200	General Conditions
Document 00 7201	Supplementary Conditions
Document 00 7316	Supplementary Conditions – Insurance
Document 00 7319	Supplemental Conditions – Hazardous Materials
Document 00 7380	Apprenticeship Programs
Document 00 9113	Addenda
[LIST ADDENDA ISSUED]	

Specifications Divisions 1 through 33  
Drawings and Schedules listed in Document 00 0115

- 5.02** There are no Contract Documents other than those listed above. The Contract Documents may only be amended, modified or supplemented as provided in Document 00 7200 (General Conditions).

## **ARTICLE 6 – CONTRACTOR’S REPRESENTATIONS**

In order to induce City to enter into this Agreement, Contractor makes the following representations and warranties:

- 6.01** Contractor has visited the site and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as-built conditions, and all local conditions, and federal, state and local laws and regulations that in any manner may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Contractor and safety precautions and programs incident thereto.
- 6.02** Contractor has examined thoroughly and understood all reports of exploration and tests of subsurface conditions, as-built drawings, drawings or reports, available for Bidding purposes, of physical conditions, including Underground Facilities, identified in the Bid Documents, or which may appear in the Drawings, and accepts the determination set forth in these documents and Document 00 7200 General Conditions of the limited extent of the information contained in such reports and drawings upon which the Contractor may be entitled to rely. Contractor agrees that except for the information so identified, Contractor does not and shall not rely on any other information contained in such reports and drawings.
- 6.03** Contractor has conducted or obtained and has understood all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in Article 6.02 above) which pertain to the subsurface conditions, as-built conditions, Underground Facilities and all other physical conditions at or contiguous to the site or otherwise which may affect the cost, progress, performance or furnishing of Work, as Contractor considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, test, reports, studies or similar information or data are or will be required by Contractor for such purposes.
- 6.04** Contractor has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- 6.05** Contractor has given the Project Manager prompt written notice of all conflicts, errors, ambiguities or discrepancies that it has discovered in or among the Contract Documents and as-built and actual conditions and the written resolution thereof through Addenda issued by Project Manager is acceptable to Contractor.

## **ARTICLE 7 – MISCELLANEOUS**

- 7.01** Terms and abbreviations used in this Agreement are defined in Document 00 7200 (General Conditions) and Section 01 4200 (References and Definitions) and will have the meaning indicated therein.

- 7.02** It is understood and agreed that in no instance are the persons signing this Agreement for or on behalf of City or acting as an employee, agent, or representative of City, liable on this Agreement or any of the Contract Documents, or upon any warranty of authority, or otherwise, and it is further understood and agreed that liability of City is limited and confined to such liability as authorized or imposed by the Contract Documents or applicable law.
- 7.03** In entering into a public works contract or a subcontract to supply goods, services or materials pursuant to a public works contract, Contractor or Subcontractor offers and agrees to assign to the awarding body all rights, title and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. §15) or under the Cartwright Act (Chapter 2 (commencing with §16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time City tenders final payment to Contractor, without further acknowledgment by the parties.
- 7.04** Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are deemed included in the Contract Documents and on file at Owner's Office, and shall be made available to any interested party on request. Pursuant to California Labor Code §§ 1860 and 1861, in accordance with the provisions of Section 3700 of the Labor Code, every contractor will be required to secure the payment of compensation to his employees. Contractor represents that it is aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor shall comply with such provisions before commencing the performance of the Work of the Contract Documents.
- 7.05** No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].
- No contractor or subcontractor may be awarded a contract for public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5
- This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.
- 7.06** This Agreement and the Contract Documents shall be deemed to have been entered into in the County of Alameda, State of California, and governed in all respects by California law (excluding choice of law rules). The exclusive venue for all disputes or litigation hereunder shall be in the Superior Court for the County of Alameda.



IN WITNESS WHEREOF the parties have executed this Agreement in triplicate the day and year first above written.

**CITY OF BERKELEY**

By: \_\_\_\_\_  
City Manager

\_\_\_\_\_  
(Print Name)

By: \_\_\_\_\_  
(Signature)

Its: \_\_\_\_\_  
Title (If Corporation: Chairman, President  
or Vice President)

Attest:  
CITY OF BERKELEY

\_\_\_\_\_  
City Clerk

\_\_\_\_\_  
(Print Name)

By: \_\_\_\_\_  
(Signature)

Its: \_\_\_\_\_  
Title (If Corporation: Secretary, Assistant  
Secretary, Chief Financial Officer or  
Assistant Treasurer)

Pre-approved as to form:  
CITY ATTORNEY  
8/2016

**END OF DOCUMENT**

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**DOCUMENT 00 5500**

**NOTICE TO PROCEED**

Dated: \_\_\_\_\_, 20\_\_

To: \_\_\_\_\_  
(Contractor)

Address: \_\_\_\_\_

CONTRACT FOR: **City of Berkeley Willard Park Clubhouse & Restroom Replacement AT 2720 Hillegass Avenue**

CONTRACT NO:

You are notified that the Contract Time under the above Contract will commence to run on \_\_\_\_\_ [20\_\_]. On that date, you are to start performing your obligations with respect to Work at the Site under the Contract Documents. In accordance with Article 2 of Document 00 5200 (Agreement), the dates of Substantial Completion and Final Completion for the entire Work are \_\_\_\_\_, [20\_\_] and \_\_\_\_\_, [20\_\_], respectively.

Before you may start any Work at the Site, you must:

1. Submit certified Safety Program and related information
2. Submit copies of applicable permits
3. Submit approved fire protection plan, if applicable
4. Submit progress schedule
5. Submit schedule of values
6. Submit schedule of submittals

**OWNER**

By: \_\_\_\_\_

Its: \_\_\_\_\_

**END OF DOCUMENT**

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**DOCUMENT 00 6113.13****CONSTRUCTION PERFORMANCE BOND**

KNOW ALL PERSONS BY THESE PRESENTS:

**1.01** THAT WHEREAS, **City of Berkeley** ("City"), a public agency of the State of California, has awarded to as Principal, Specification Number **23-11596-C**, dated the \_\_\_ day of \_\_\_\_\_, 20\_\_\_ (the "Contract"), titled Willard Park Clubhouse & Restroom Replacement in the amount of , which Contract is by this reference made a part hereof, for the work of the following Contract:

**Willard Park Clubhouse & Restroom Replacement Project**

**1.02** AND WHEREAS, Principal is required to furnish a bond in connection with the Contract, guaranteeing the faithful performance thereof;

**1.03** NOW, THEREFORE, we, the undersigned Principal and **(Name of Surety)** \_\_\_\_\_ as Surety are held and firmly bound unto City in the sum of 100% OF THE CONTRACT PRICE to be paid to City or its successors and assigns; for which payment, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

**1.04** THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, or its heirs, executors, administrators, successors, or assigns approved by City, shall promptly and faithfully perform the covenants, conditions, and agreements of the Contract during the original term and any extensions thereof as may be granted by City, with or without notice to Surety, and during the period of any guarantees or warranties required under the Contract, and shall also promptly and faithfully perform all the covenants, conditions, and agreements of any alteration of the Contract made as therein provided, notice of which alterations to Surety being hereby waived, on Principal's part to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify, defend, protect, and hold harmless City as stipulated in the Contract, then this obligation shall become and be null and void; otherwise it shall be and remain in full force and effect.

**1.05** No extension of time, change, alteration, modification, or addition to the Contract, or of the work required thereunder, or work or actions by City to mitigate the damages resulting from any breach in performance by Contractor, shall release or exonerate Surety on this bond or in any way affect the obligation of this bond; and Surety does hereby waive notice of any such extension of time, change, alteration, modification, or addition.

**1.06** Whenever Principal shall be and declared by City in default under the Contract, Surety shall promptly remedy the default, or shall promptly, and in no event later than thirty (30) calendar days from notice:

- A. Undertake through its agents or independent contractors (but having qualifications and experience reasonably acceptable to City, to complete the Contract in accordance with its terms and conditions and to pay and perform all obligations of Principal under the Contract, including without limitation, all obligations with respect to warranties, guarantees, indemnities, and the payment of liquidated damages; or
- B. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and, upon determination by City of the lowest responsible bidder, arrange for a contract between such bidder and City and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract Sum, and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees, and the payment of liquidated damages; but, in any event, Surety's total obligations hereunder shall not exceed the amount set forth in the third

paragraph hereof. The term "balance of the Contract Sum," as used in this paragraph, shall mean the total amount payable by City to the Principal under the Contract and any amendments thereto, less the amount paid by City to Principal.

- 1.07 Surety's obligations hereunder are independent of the obligations of any other surety for the performance of the Contract, and suit may be brought against Surety and such other sureties, jointly and severally, or against any one or more of them, or against less than all of them without impairing City's rights against the others.
- 1.08 Surety may not use Contractor to complete the Contract absent City's Consent. City shall have the right in its sole discretion to continue the work of the Contract, as necessary following a default and/or termination, as necessary to prevent risks of personal injury, property damage or delay to the Project.
- 1.09 No right of action shall accrue on this bond to or for the use of any person or corporation other than City or its successors or assigns.
- 1.10 Surety shall join in any proceedings brought under the Contract upon City's demand, and shall be bound by any judgment.
- 1.11 Correspondence or claims relating to this bond shall be sent to Surety at the address set forth below.

IN WITNESS WHEREOF, we have hereunto set our hands this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Company: \_\_\_\_\_ (Corp. Seal)

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**END OF DOCUMENT**

**DOCUMENT 00 6113.16****CONSTRUCTION LABOR AND MATERIAL PAYMENT BOND**

KNOW ALL PERSONS BY THESE PRESENTS:

**1.01** THAT WHEREAS, City of Berkeley ("City") has awarded to\_\_ as Principal, Specification No. **23-11596-C** dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_ (the "Contract"), titled Willard Park Clubhouse & Restroom Replacement in the amount of , which Contract is by this reference made a part hereof, for the work of the following Contract:

**Willard Park Clubhouse & Restroom Replacement Project**

**1.02** AND WHEREAS, Principal is required to furnish a bond in connection with the Contract to secure the payment of claims of laborers, mechanics, material suppliers, and other persons as provided by law;

**1.03** NOW, THEREFORE, we, the undersigned Principal and **(Name of Surety)** \_\_\_\_\_, as Surety, are held and firmly bound unto City in the sum of 100% OF THE CONTRACT PRICE (**\$** \_\_\_\_\_), for which payment well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

**1.04** THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, or its executors, administrators, successors, or assigns approved by City, or its subcontractors shall fail to pay any of the persons named in California Civil Code §3181, or amounts due under the State of California Unemployment Insurance Code with respect to work or labor performed under the Contract, or for any amounts required to be deducted, withheld, and paid over to the State of California Employment Development Department from the wages of employees of Principal and subcontractors pursuant to Section 13020 of the State of California Unemployment Insurance Code with respect to such work and labor, that Surety will pay for the same in an amount not exceeding the sum specified in this bond, plus reasonable attorneys' fees, otherwise the above obligation shall become and be null and void.

**1.05** This bond shall inure to the benefit of any of the persons named in California Civil Code §3181, as to give a right of action to such persons or their assigns in any suit brought upon this bond. The intent of this bond is to comply with the California Mechanic's Lien Law.

**1.06** Surety, for value received, hereby expressly agrees that no extension of time, change, modification, alteration, or addition to the undertakings, covenants, terms, conditions, and agreements of the Contract, or to the work to be performed thereunder, shall in any way affect the obligation of this bond; and it does hereby waive notice of any such extension of time, change, modification, alteration, or addition to the undertakings, covenants, terms, conditions, and agreements of the Contract, or to the work to be performed thereunder.

**1.07** Surety's obligations hereunder are independent of the obligations of any other surety for the payment of claims of laborers, mechanics, material suppliers, and other persons in connection with Contract; and suit may be brought against Surety and such other sureties, jointly and severally, or against any one or more of them, or against less than all of them without impairing Owner's rights against the other.

**1.08** Correspondence or claims relating to this bond shall be sent to Surety at the address set forth below.

IN WITNESS WHEREOF, we have hereunto set our hands this \_\_\_\_ day of \_\_\_\_\_,  
20\_\_\_\_.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

Company: (Corp. Seal)

Company: (Corp. Seal)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
City, State, Zip Code

\_\_\_\_\_  
City, State, Zip Code

**END OF DOCUMENT**



**DOCUMENT 00 6290****ESCROW AGREEMENT FOR SECURITY DEPOSIT IN LIEU OF RETENTION**

California Public Contract Code §22300

THIS ESCROW AGREEMENT ("Escrow Agreement") is made and entered into this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between City of Berkeley ("City"), whose address is 2180 Milvia Street, Berkeley, California 94704, ("Contractor"), whose place of business is located at \_\_\_\_\_ and \_\_\_\_\_ (**Name**), as escrow agent **OR** [ ] (**Name of Bank**) \_\_\_\_\_, a state or federally chartered bank in the State of California, whose place of business is located at \_\_\_\_\_ ("Escrow Agent").

For the consideration hereinafter set forth, City, Contractor and Escrow Agent agree as follows:

1. Pursuant to California Public Contract Code §22300, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by City pursuant to Contract Number \_\_\_\_\_ entered into between City and Contractor for Willard Park Clubhouse & Restroom Replacement located at **2720 Hillegass Avenue** in the amount of \_\_\_\_\_ dated \_\_\_\_\_, 20\_\_\_\_ (the "Contract"). Alternatively, on written request of Contractor, City shall make payments of the retention earnings directly to Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, Escrow Agent shall notify City within ten calendar days of the deposit. The market value of the securities at the time of substitution shall be at least equal to the cash amount then required to be withheld as retention under terms of Contract between Owner and Contractor. Securities shall be held in name of \_\_\_\_\_, and shall designate Contractor as the beneficial owner.
2. City shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments pursuant to Contract provisions, provided that Escrow Agent holds securities in form and amount specified in Paragraph 1 of this Document 00 6290.
3. When City makes payment(s) of retention earned directly to Escrow Agent, Escrow Agent shall hold said payment(s) for the benefit of Contractor until the time that the escrow created under this Escrow Agreement is terminated. Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow Agreement and the rights and responsibilities of the parties shall be equally applicable and binding when City pays Escrow Agent directly.
4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses of City. Such expenses and payment terms shall be determined by Owner, Contractor, and Escrow Agent.
5. Interest earned on securities or money market accounts held in escrow and all interest earned on that interest shall be for sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to City.
6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from City to Escrow Agent that City consents to withdrawal of amount sought to be withdrawn by Contractor.
7. City shall have the right to draw upon the securities in event of default by Contractor. Upon seven (7) calendar days written notice to Escrow Agent from City of the default, Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by City.
8. Upon receipt of written notification from City certifying that the Contract is final and complete, and that Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees

and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

- 9. Escrow Agent shall rely on written notifications from City and Contractor pursuant to Paragraphs 5 through 8, inclusive, of this Document 00 6290 and City and Contractor shall hold Escrow Agent harmless from Escrow Agent’s release and disbursement of securities and interest as set forth.
- 10. Names of persons who are authorized to give written notice or to receive written notice on behalf of City and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

**ON BEHALF OF CITY:**

**ON BEHALF OF CONTRACTOR:**

\_\_\_\_\_

Title

\_\_\_\_\_

Name

\_\_\_\_\_

Signature

\_\_\_\_\_

Address

\_\_\_\_\_

City/State/Zip Code

\_\_\_\_\_

Title

\_\_\_\_\_

Name

\_\_\_\_\_

Signature

\_\_\_\_\_

Address

\_\_\_\_\_

City/State/Zip Code

**ON BEHALF OF ESCROW AGENT:**

\_\_\_\_\_

Title

\_\_\_\_\_

Name

\_\_\_\_\_

Signature

\_\_\_\_\_

Address

\_\_\_\_\_

City/State/Zip Code

IN WITNESS WHEREOF, the parties have executed this Escrow Agreement by their proper officers on the date first set forth above.

**CITY**

**CONTRACTOR**

\_\_\_\_\_

\_\_\_\_\_

Title

\_\_\_\_\_

Name

\_\_\_\_\_

Signature

\_\_\_\_\_

\_\_\_\_\_

Title

\_\_\_\_\_

Name

\_\_\_\_\_

Signature

ATTEST

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

City Clerk

**ESCROW AGENT**

\_\_\_\_\_

\_\_\_\_\_  
Title

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Signature

Pre-approved as to form:  
CITY ATTORNEY  
8/2016

At the time the Escrow Account is opened, City and Contractor shall deliver to Escrow Agent a fully executed counterpart of this Document 00 6290.

**END OF DOCUMENT**

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**DOCUMENT 00 6325**

**SUBSTITUTION REQUEST FORM**

To: Stacey Rutherford, **Project Manager, City of Berkeley**  
**(510) 981-6738**

<b>PROJECT: Willard Park Clubhouse &amp; Restroom Replacement</b>	<b>Contractor:</b>
<b>City's Specification No. : 23-11596-C</b>	

Substitution Request By:	Firm:
--------------------------	-------

Transmittal Record	Attn:	Firm:	Date Sent:	Date Rec'd:	Date Due:
Contractor to City					
Contractor to Architect					
City / Architect to Consultant					
Architect to City Representative					
City Representative to Contractor					

We hereby submit for your consideration the following product instead of the specified item for the Project:

Section / Drawing	Article	Specified Item
<b>Proposed Substitution:</b>		

We have (a) attached manufacturer's literature, including complete technical data and laboratory test results, if applicable, (b) attached an explanation of why proposed substitution is a true equivalent to specified item, (c) included complete information on changes to Contract Documents that the proposed substitution will require for its proper installation, and (d) filled in the blanks below:

**Contractor to complete questions that follow and certifies to the accuracy of all answers:**

A.	Does the substitution affect dimensions shown on Drawings? Yes ___ / No ___. If No, please explain proposed mitigation and why substitution is equivalent to originally specified item:
B.	Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes ___ / No ___. If No, please state reasons explain why substitution is equivalent to originally specified item:
C.	What effect does the substitution have on other trades? No effect: ___ / Some effect ___. If substitution will affect other trades, please explain the effect and why substitution is equivalent to originally specified item:
D.	Will substitution cause change to Project Schedule, or to critical delivery dates? Add? Shorten? If the substitution will add to schedule dates or affect critical activities, please explain why substitution is equivalent to originally specified item:
E.	Please describe differences between proposed substitution and specified item? Please explain and identify any and all differences, and please explain why substitution is equivalent to originally specified item:
F.	What is the Cost Differential to Contractor in original specified item and proposed substitution including all mark-ups? [If substitution requested during bid period, skip this question.]
G.	Are Manufacturer's guarantees for the proposed item the same as for item specified? Yes ____; No _____. If No, please explain why substitution is equivalent to originally specified item:

H.	Contractor accepts full responsibility for delays caused by redesign of other items of the Work necessitated by substitution? Yes ___ / No ___. If No, please state reasons and explain why substitution is equivalent to originally specified item:
I.	Contractor states that the function, appearance and quality are equivalent or superior to the specified item? Yes ___ / No ___. If No, please explain why substitution is equivalent to originally specified item:

We certify that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item, except as we may specifically state otherwise in this request.

Submitted by: \_\_\_\_\_ Signature: \_\_\_\_\_

Firm: \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_ Phone/ Fax: \_\_\_\_\_

Remarks: \_\_\_\_\_

**Consultant Response:**  
 Accepted  
 Not Accepted  
 Accepted As Noted  
 Received Too Late

**City Representative Response:**  
 Accepted  
 Not Accepted  
 Accepted As Noted  
 Received Too Late

Remarks: \_\_\_\_\_

Remarks: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

**END OF DOCUMENT**

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**DOCUMENT 00 6530**

**AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS**

**[Public Contract Code § 7100]**

THIS AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS (“Agreement and Release”), made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between City of Berkeley (“City”), and (“Contractor”), whose place of business is at .

**RECITALS**

- A. City and Contractor entered into Contract Number **THE ITEMS ABOVE IN RED DO NOT AUTO POPULATE FROM EXCEL** (the “Contract”) for construction of City **Willard Park Clubhouse & Restroom Replacement** located at **2720 Hillegass Avenue**, California.
- B. The Work under the Contract has been completed.

**AGREEMENT**

NOW THEREFORE, it is mutually agreed between City and Contractor as follows:

1. Contractor will not be assessed liquidated damages except as detailed below:
 

Original Contract Sum	\$ _____
Modified Contract Sum	\$ _____
Payment to Date	\$ _____
Liquidated Damages	\$ _____
Payment Due Contractor	\$ _____
2. Subject to the provisions of this Agreement and Release, Owner will forthwith pay to Contractor the sum of [ (\$)] under the Contract, less any amounts withheld under the Contract or represented by any Notice to Withhold Funds on file with City as of the date of such payment.
3. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against City arising from the Contract, except for the claims described in Paragraph 4 of this Document 00 6530. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against City, and all if its agents, employees, consultants, inspectors, representatives, assignees and transferees, except for the Disputed Claims set forth in Paragraph 4 of this Document 00 6530. Nothing in this Agreement and Release shall limit or modify Contractor’s continuing obligations described in Paragraph 6 of this Document 00 6530.
4. The following claims submitted under Document 00 7200 (General Conditions), Article 12, are disputed (hereinafter, the “Disputed Claims”) and are specifically excluded from the operation of this Agreement and Release.

**[Insert information in Chart below, affix attachment if necessary]**

CLAIM NO.	DATE SUBMITTED	DESCRIPTION OF CLAIM	AMOUNT OF CLAIM

5. Consistent with California Public Contract Code §7100, Contractor hereby agrees that, in consideration of the payment set forth in Paragraph 2 of this Document 00 6530, Contractor hereby releases and forever discharges City, and all of its agents, employees, consultants, inspectors, assignees and transferees from any and all liability, claims, demands, actions or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.
6. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.
7. Contractor shall immediately defend, indemnify and hold harmless City, any of the City's Representatives, Project Manager, and all of their agents, employees, consultants, inspectors, assignees and transferees, from any and all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities that may be asserted against them by any of Contractor's suppliers and/or Subcontractors of any tier and/or any suppliers to them for any and all labor, materials, supplies and equipment used, or contemplated to be used in the performance of the Contract, except for the Disputed Claims set forth in Paragraph 4 of this Document 00 6530.
8. Contractor hereby waives the provisions of California Civil Code §1542, which provide as follows:
 

**A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER, MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.**
9. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable, and if any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal or other law, ruling, or regulation, then such provision, or part thereof shall remain in force and effect only to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.
10. Contractor represents and warrants that it is the true and lawful owner of all claims and other matters released pursuant to this Agreement and Release, and that it has full right, title and authority to enter into this instrument. Each party represents and warrants that it has been represented by counsel of its own choosing in connection with this Agreement and Release.
11. All rights of City shall survive completion of the Work or termination of the Contract, and execution of this Agreement and Release.

**\*\*\* CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING \*\*\***

**CITY**

By: \_\_\_\_\_  
Signature

Name: \_\_\_\_\_  
Print

Its: \_\_\_\_\_  
Title

**ATTEST:**

\_\_\_\_\_  
Title

\_\_\_\_\_  
Print

**[CONTRACTOR]**

By: \_\_\_\_\_  
Signature

Name: \_\_\_\_\_  
Print

Its: \_\_\_\_\_  
Title

**[CONTRACTOR]**

By: \_\_\_\_\_  
Signature

Name: \_\_\_\_\_  
Print

Its: \_\_\_\_\_  
Title

Pre-approved as to form:  
CITY ATTORNEY  
8/2016

**END OF DOCUMENT**

**DOCUMENT 00 6536**

**GUARANTY**

TO: The City of Berkeley ("City"), for construction of Willard Park Clubhouse & Restroom Replacement located at 2720 Hillegass Avenue, California.

The undersigned guarantees all construction performed on this Project and also guarantees all material and equipment incorporated therein.

Contractor hereby grants to City for a period of one year following the date of Final Acceptance of the Work completed, or such longer period specified in the Contract Documents, its unconditional warranty of the quality and adequacy of all of the Work including, without limitation, all labor, materials and equipment provided by Contractor and its Subcontractors of all tiers in connection with the Work.

Neither final payment nor use nor occupancy of the Work performed by the Contractor shall constitute an acceptance of Work not done in accordance with this Guaranty or relieve Contractor of liability in respect to any express warranties or responsibilities for faulty materials or workmanship. Contractor shall remedy any defects in the Work and pay for any damage resulting therefrom, which shall appear within one year, or longer if specified, from the date of Final Acceptance of the Work completed.

If within one year after the date of Final Acceptance of the Work completed, or such longer period of time as may be prescribed by laws or regulations, or by the terms of Contract Documents, any Work is found to be Defective, Contractor shall promptly, without cost to City and in accordance with City's written instructions, correct such Defective Work. Contractor shall remove any Defective Work rejected by City and replace it with Work that is not Defective, and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If Contractor fails to promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, City may have the Defective Work corrected or the rejected Work removed and replaced. Contractor shall pay for all claims, costs, losses and damages caused by or resulting from such removal and replacement. Where Contractor fails to correct Defective Work, or defects are discovered outside the correction period, City shall have all rights and remedies granted by law.

Inspection of the Work shall not relieve Contractor of any of its obligations under the Contract Documents. Even though equipment, materials, or Work required to be provided under the Contract Documents have been inspected, accepted, and estimated for payment, Contractor shall, at its own expense, replace or repair any such equipment, material, or Work found to be Defective or otherwise not to comply with the requirements of the Contract Documents up to the end of the guaranty period.

All abbreviations and definitions of terms used in this Agreement shall have the meanings set forth in the Contract Documents.

The foregoing Guaranty is in addition to any other warranties of Contractor contained in the Contract Documents, and not in lieu of, any and all other liability imposed on Contractor under the Contract Documents and at law with respect to Contractor's duties, obligations, and performance under the Contract Documents. In the event of any conflict or inconsistency between the terms of this Guaranty and any warranty or obligation of the Contractor under the Contract Documents or at law, such inconsistency or conflict shall be resolved in favor of the higher level of obligation of the Contractor.

Date: \_\_\_\_\_, 20\_\_

\_\_\_\_\_  
Contractor's name

By: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
City, State, Zip code

**END OF DOCUMENT**

**DOCUMENT 00 6580****CITY OF BERKELEY CONTRACTING POLICIES**

Contractor shall comply with the City of Berkeley's adopted employment policies applying to City construction projects as described in Document 00 7317. The following certifications/forms shall be submitted in accordance with Document 00 2113 Instructions to Bidders:

- Memorandum of Understanding
- Workforce Composition Form
- Agreement for Change in Subcontractors
- Nuclear Free Zone Disclosure Form
- Oppressive States Compliance Statement
- Sanctuary City Compliance Certification
- Hardwood Disclosure Form
- First Source Construction Agreement (for projects between \$100,000 and \$500,000)  
- Not applicable to this project.
- Community Workforce Agreement, Agreement to be Bound (for projects over \$500,000)
- Right to Audit Form
- Certification Of Compliance With Equal Benefits Ordinance
- Taxpayer Identification Report
- Contractor's License
- City of Berkeley Business License

**CITY OF BERKELEY  
MEMORANDUM OF UNDERSTANDING  
(MOU)**

1. The Contractor (and all Subcontractors) agree not to discriminate pursuant to City Ordinance No. 5876.
2. The Contractor agrees that he/she is also responsible for his/her Subcontractors' compliance with City of Berkeley Ordinance No. 5876.
3. For contracts over \$100,000, the Contractor agrees to comply with Ordinance No. 5876 as applied to the First Source Program (see Section 8 of Ordinance 5876).

The Contractor agrees to submit periodic employment and wage reports to the City's Contract Compliance Officer upon reasonable request.

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
City of Berkeley Contracts Compliance Officer  
Or his/her designee

\_\_\_\_\_  
Date

\_\_\_\_\_  
Date



**CITY OF BERKELEY  
WORKFORCE COMPOSITION FORM FOR ALL CONSTRUCTION CONTRACTS**

This form is to be completed and submitted prior to the Contract Compliance Conference. The Contractor and all Subcontractors who will do work valued at \$3,000 or more are required to submit this form. Weekly payroll reports will be compared to this listing to monitor for compliance. A payroll printout or other listing of employees providing the same information will be accepted.

Name of Contractor/Subcontractor: \_\_\_\_\_

Project: \_\_\_\_\_

Name		Race*	Sex**	Trade/Craft	Basic Hourly Rate	Hire Date	Employees to be used on this job

\* A=Asian or Pacific Islander    \*\*M = Male  
 AI=American Indian            \*\*F = Female  
 B=Afro American  
 C=Caucasian  
 H=Hispanic (Mexican, Puerto Rican,  
 Spanish, Cuban, Chicano, Central  
 or South American)  
 8/91

Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Contractor/Subcontractor

Verified By: \_\_\_\_\_ Date: \_\_\_\_\_  
 City of Berkeley Contracts Compliance Officer  
 or his/her designee

**CITY OF BERKELEY  
AGREEMENT FOR CHANGE IN SUB-CONTRACTORS**

I agree to use the Subcontractor(s) listed in the signed contract with the City of Berkeley. If it should become necessary to change Subcontractors, I will notify the Capital Projects Manager by completing the following information:

Current Subcontractor(s)	Alternate Subcontractors	Reason for Change	Date

Signed by:

Verified by:

\_\_\_\_\_  
Prime Contractor

\_\_\_\_\_  
Subcontractor

\_\_\_\_\_  
City of Berkeley Contracts Compliance Officer  
Or his/her designee

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

**CITY OF BERKELEY  
NUCLEAR FREE ZONE DISCLOSURE FORM**

I (we) certify that:

1. I am (we are) fully cognizant of any and all contracts held, products made or otherwise handled by this business entity, and of any such that are anticipated to be entered into, produced or handled for the duration of its contract(s) with the City of Berkeley. (To this end, this disclosure form may be signed by more than one individual, if a description of which type of contracts each individual is cognizant is attached.)

2. I (we) understand that Section 12.90.070 of the Nuclear Free Berkeley Act (Berkeley Municipal Code Ch. 12.90; Ordinance No. 5784-N.S.) prohibits the City of Berkeley from contracting with any person or business that knowingly engages in work for nuclear weapons.

3. I (we) understand the meaning of the following terms as set forth in Berkeley Municipal Code section 12.90.130:

"Work for nuclear weapons" is any work the purpose of which is the development, testing, production, maintenance or storage of nuclear weapons or the components of nuclear weapons; or any secret or classified research or evaluation of nuclear weapons; or any operation, management or administration of such work.

"Nuclear weapon" is any device, the intended explosion of which results from the energy released by reactions involving atomic nuclei, either fission or fusion or both. This definition of nuclear weapons includes the means of transporting, guiding, propelling or triggering the weapon if and only if such means is destroyed or rendered useless in the normal propelling, triggering, or detonation of the weapon.

"Component of a nuclear weapon" is any device, radioactive or non-radioactive, the primary intended function of which is to contribute to the operation of a nuclear weapon (or be a part of a nuclear weapon).

4. Neither this business entity nor its parent nor any of its subsidiaries engages in work for nuclear weapons or anticipates entering into such work for the duration of its contract(s) with the City of Berkeley.

I (we) declare under penalty of perjury of the laws of the State of California that the foregoing is true and correct.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Printed Name and Title(s): \_\_\_\_\_

Company: \_\_\_\_\_

**CITY OF BERKELEY**

**Oppressive States Compliance Statement for Personal Services**

The undersigned, an authorized agent of \_\_\_\_\_ (hereafter "Vendor"), has had an opportunity to review the requirements of Berkeley City Council Resolution Nos. 59,853-N.S., 60,382-N.S., and 70,606-N.S., (hereafter "Resolutions"). Vendor understands and agrees that the City may choose with whom it will maintain business relations and may refrain from contracting with those Business Entities which maintain business relationships with morally repugnant regimes. Vendor understands the meaning of the following terms used in the Resolutions:

"Business Entity" means "any individual, firm, partnership, corporation, association or any other commercial organization, including parent-entities and wholly-owned subsidiaries" (to the extent that their operations are related to the purpose of the contract with the City).

"Oppressive State" means: **Tibet Autonomous Region, the provinces of Aho, Kham, and U-Tsang; and Burma (Myanmar)**

"Personal Services" means "the performance of any work or labor and shall also include acting as an independent contractor or providing any consulting advice or assistance, or otherwise acting as an agent pursuant to a contractual relationship."

Contractor understands that it is not eligible to receive or retain a City contract if at the time the contract is executed, or at any time during the term of the contract it provides Personal Services to:

- a. The governing regime in any Oppressive State.
- b. Any business or corporation organized under the authority of the governing regime of any Oppressive State.
- c. Any person for the express purpose of assisting in business operations or trading with any public or private entity located in any Oppressive State.

Vendor further understands and agrees that Vendor's failure to comply with the Resolution shall constitute a default of the contract and the City Manager may terminate the contract and bar Vendor from bidding on future contracts with the City for five (5) years from the effective date of the contract termination.

The undersigned is familiar with, or has made a reasonable effort to become familiar with, Vendor's business structure and the geographic extent of its operations. By executing the Statement, Vendor certifies that it complies with the requirements of the Resolution and that if any time during the term of the contract it ceases to comply, Vendor will promptly notify the City Manager in writing.

Based on the foregoing, the undersigned declares under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Printed Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Business Entity: \_\_\_\_\_

I am unable to execute this Statement; however, Vendor is exempt under Section VII of the Resolution. I have attached a separate statement explaining the reason(s) Vendor cannot comply and the basis for any requested exemption.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Contract Description/Specification No.: \_\_\_\_\_

**ATTACHMENT D**

Rev. 1/1/2023

**CITY OF BERKELEY**  
**Sanctuary City Compliance Statement**

The undersigned, an authorized agent of \_\_\_\_\_(hereafter "Contractor"), has had an opportunity to review the requirements of Berkeley Code Chapter 13.105 (hereafter "Sanctuary City Contracting Ordinance" or "SCCO"). Contractor understands and agrees that the City may choose with whom it will maintain business relations and may refrain from contracting with any person or entity that provides Data Broker or Extreme Vetting services to the U.S. Immigration and Customs Enforcement Division of the United States Department of Homeland Security ("ICE"). Contractor understands the meaning of the following terms used in the SCCO:

- a. "Data Broker" means either of the following:
  - i. The collection of information, including personal information about consumers, from a wide variety of sources for the purposes of reselling such information to their customers, which include both private-sector business and government agencies;
  - ii. The aggregation of data that was collected for another purpose from that for which it is ultimately used.
- b. "Extreme Vetting" means data mining, threat modeling, predictive risk analysis, or other similar services." Extreme Vetting does not include:
  - i. The City's computer-network health and performance tools;
  - ii. Cybersecurity capabilities, technologies and systems used by the City of Berkeley Department of Information Technology to predict, monitor for, prevent, and protect technology infrastructure and systems owned and operated by the City of Berkeley from potential cybersecurity events and cyber-forensic based investigations and prosecutions of illegal computer based activity.

Contractor understands that it is not eligible to receive or retain a City contract if at the time the Contract is executed, or at any time during the term of the Contract, it provides Data Broker or Extreme Vetting services to ICE.

Contractor further understands and agrees that Contractor 's failure to comply with the SCCO shall constitute a material default of the Contract and the City Manager may terminate the Contract and bar Contractor from bidding on future contracts with the City for five (5) years from the effective date of the contract termination.

By executing this Statement, Contractor certifies that it complies with the requirements of the SCCO and that if any time during the term of the Contract it ceases to comply, Contractor will promptly notify the City Manager in writing. Any person or entity who knowingly or willingly supplies false information in violation of the SCCO shall be guilty of a misdemeanor and up to a \$1,000 fine.

Based on the foregoing, the undersigned declares under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed this \_\_\_\_\_day of \_\_\_\_\_, 20\_\_, at \_\_\_\_\_, California.

Printed Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Business Entity: \_\_\_\_\_

SCCO CompStmnt (Oct2019)

**CITY OF BERKELEY  
HARDWOOD DISCLOSURE FORM  
For use by vendors on contracts utilizing lumber**

1. I understand that on December 12, 1995, the City Council directed staff not to purchase lumber from companies that purchase or sell wood or paper products that come from tropical rainforests. I understand that wood species with tropical origins include, but are not limited to: Apitong, Banak, Bocote, Bubinga, Cocobolo, Cordia, Ebony, Goncalo alves, Greenheart, Iroko, Jelutang, Koa, Luauan, Mahogany, Meranti, Padauk, Purpleheart, Ramin, Rosewood, Satinwood, Teak, Virola, Wenge, and Zebrawood.
2. I am knowledgeable about the wood and paper products purchased and sold by this company.
3. This company does not currently purchase or sell wood or paper products having their origins in tropical rainforests. In addition, this company will not, for the duration of its contract with the City of Berkeley, purchase or sell wood or paper products having their origins in tropical rainforests.

I declare under penalty of perjury of the laws of the State of California that the foregoing is true and correct.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name & Title: \_\_\_\_\_

Company: \_\_\_\_\_

I am unable to sign this disclosure form for the following reason(s):

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**AGREEMENT TO BE BOUND**

The undersigned, as a Contractor or Subcontractor ("Contractor") on a City Project ("Project"), for and in consideration of the award to it of a contract to perform work on said Project, and in further consideration of the mutual promises made in the Project's Community Workforce Agreement ("Agreement"), a copy which was received and is acknowledged, hereby:

1. Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all amendments and supplements now existing or which are later made to said Agreement.
2. Certifies that it has no commitments or agreements which would preclude its full and complete compliance with the terms and conditions of said Agreement;
3. Agrees to secure from any Contractor (as defined in said Agreement) which is or becomes a subcontractor (or any tier) to it, and from any successors, a duly executed Agreement to be Bound in form identical to this document.
4. Contractor agrees that it shall be bound by all applicable trust agreements and plans for the provision of such fringe benefits as accrue to the direct benefit of the construction persons, including Health and Welfare, Pension, Training, Vacation, and/or other direct benefits provided pursuant to the appropriate craft agreement contained in Schedule "A" of Agreement.

Date: \_\_\_\_\_

Company Name: \_\_\_\_\_

Name of Prime Contractor or Higher Level Subcontractor:

\_\_\_\_\_

Name of Project: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Email Address: \_\_\_\_\_

Contractor's License #: \_\_\_\_\_

Motor Carrier Permit (CA) #: \_\_\_\_\_

## **CITY OF BERKELEY RIGHT TO AUDIT FORM**

The Contractor agrees that pursuant to Section 61 of the Berkeley City Charter, the City Auditor's office may conduct an audit of Contractor's financial, performance and compliance records maintained in connection with the operations and services performed under this contract.

In the event of such audit, Contractor agrees to provide the Auditor with reasonable access to Contractor's employees and make all such financial, performance and compliance records available to the Auditor's office. City agrees to provide Contractor an opportunity to discuss and respond to any findings before a final audit report is filed.

Contractor's signature \_\_\_\_\_ Date: \_\_\_\_\_

Print Name and Title: \_\_\_\_\_

Company: \_\_\_\_\_



To be completed by  
Contractor/Vendor

**Form EBO-1  
CITY OF BERKELEY**



**CERTIFICATION OF COMPLIANCE WITH EQUAL BENEFITS ORDINANCE**

If you are a **contractor**, return this form to the originating department/project manager. If you are a **vendor** (supplier of goods), return this form to the Purchasing Division of the Finance Dept.

**SECTION 1. CONTRACTOR/VENDOR INFORMATION**

Name:		Vendor No.:	
Address:	City:	State:	ZIP:
Contact Person:		Telephone:	
E-mail Address:		Fax No.:	

**SECTION 2. COMPLIANCE QUESTIONS**

- A. The EBO is inapplicable to this contract because the contractor/vendor has no employees.  
 Yes  No (If "Yes," proceed to Section 5; if "No," continue to the next question.)
- B. Does your company provide (or make available at the employees' expense) any employee benefits?  
 Yes  No  
 If "Yes," continue to Question C.  
 If "No," proceed to Section 5. (The EBO is not applicable to you.)
- C. Does your company provide (or make available at the employees' expense) any benefits to the spouse of an employee? .....  Yes  No
- D. Does your company provide (or make available at the employees' expense) any benefits to the domestic partner of an employee? .....  Yes  No  
**If you answered "No" to both** Questions C and D, proceed to Section 5. (The EBO is not applicable to this contract.)  
**If you answered "Yes" to both** Questions C and D, please continue to Question E.  
**If you answered "Yes"** to Question C and **"No"** to Question D, please continue to Section 3.
- E. Are the benefits that are available to the spouse of an employee identical to the benefits that are available to the domestic partner of the employee? .....  Yes  No  
**If you answered "Yes,"** proceed to Section 4. (You are in compliance with the EBO.)  
**If you answered "No,"** continue to Section 3.

**SECTION 3. PROVISIONAL COMPLIANCE**

- A. Contractor/vendor is not in compliance with the EBO now but will comply by the following date:
  - By the first effective date after the first open enrollment process following the contract start date, not to exceed two years, if the Contractor submits evidence of taking reasonable measures to comply with the EBO; or
  - At such time that administrative steps can be taken to incorporate nondiscrimination in benefits in the Contractor's infrastructure, not to exceed three months; or
  - Upon expiration of the contractor's current collective bargaining agreement(s).
- B. If you have taken all reasonable measures to comply with the EBO but are unable to do so, do you agree to provide employees with a cash equivalent?\* .....  Yes  No

\* The cash equivalent is the amount of money your company pays for spousal benefits that are unavailable for domestic partners.

**SECTION 4. REQUIRED DOCUMENTATION**

At time of issuance of purchase order or contract award, you may be required by the City to provide documentation (copy of employee handbook, eligibility statement from your plans, insurance provider statements, etc.) to verify that you do not discriminate in the provision of benefits.

**SECTION 5. CERTIFICATION**

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that I am authorized to bind this entity contractually. By signing this certification, I further agree to comply with all additional obligations of the Equal Benefits Ordinance that are set forth in the Berkeley Municipal Code and in the terms of the contract or purchase order with the City.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, in the year \_\_\_\_\_, at \_\_\_\_\_, \_\_\_\_\_  
(City) (State)

\_\_\_\_\_  
Name (please print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Federal ID or Social Security Number

**FOR CITY OF BERKELEY USE ONLY**

- Non-Compliant (The City may not do business with this contractor/vendor)
- One-Person Contractor/Vendor       Full Compliance       Reasonable Measures
- Provisional Compliance Category, Full Compliance by Date: \_\_\_\_\_
- Staff Name(*Sign and Print*): \_\_\_\_\_ Date: \_\_\_\_\_

**TAXPAYER IDENTIFICATION REPORT**

NAME/COMPANY'S NAME: \_\_\_\_\_

\_\_\_\_\_

MAILING ADDRESS: \_\_\_\_\_

\_\_\_\_\_

SOCIAL SECURITY NO.: \_\_\_\_\_

OR

EMPLOYER IDENTIFICATION NO.: \_\_\_\_\_

My Company is a Corporation [ ]

My Company is not a Corporation [ ]

I certify that the above information is true and correct:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

The Tax Equity and Fiscal Responsibility Act of 1982 (Public Law 97-248) requires the above reporting information be furnished to the City.

Persons who do not furnish their tax information numbers become subject to backup withholding by the City at a rate of 20% from each disbursement made to the recipient.

**END OF DOCUMENT**

**DOCUMENT 007200**

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## GENERAL CONDITIONS

### ARTICLE 1 – INTERPRETATION OF CONTRACT DOCUMENTS

#### 1.01 Interpretation Of Documents

- A. Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- B. Individual Contract Documents subdivide at first level into Articles, and then into paragraphs.

#### 1.02 Order Of Precedence Of Documents

- A. In the case of discrepancy or ambiguity in the Contract Documents, the following order of precedence shall prevail:
  - 1. Modifications in inverse chronological order (i.e., most recent first), and in the same order as specific portions they are modifying;
  - 2. Agreement Forms (Document 00 5200), and terms and conditions referenced therein;
  - 3. Supplementary General Conditions (Document 00 7201 et seq), if included;
  - 4. General Conditions (Document 00 7200);
  - 5. Division 1 Specifications, if included;
  - 6. Drawings and Technical Specifications (Division 2 and above);
  - 7. Written numbers over figures, unless obviously incorrect;
  - 8. Figured dimensions over scaled dimensions;
  - 9. Large-scale Drawings over small-scale Drawings.
- B. Any conflict between Drawings and Technical Specifications (Division 2 and above) will be resolved in favor of the document of the latest date (i.e., the most recent document), and if the dates are the same or not determinable, then in favor of Specifications.
- C. Any conflict between a bill or list of materials shown in the Contract Documents and the actual quantities required to complete Work required by Contract Documents, will be resolved in favor of the actual quantities.
- D. All Technical Specifications included in the Project manual shall be included within the Contract Documents unless identified otherwise.

### ARTICLE 2 – PRE-BID INVESTIGATIONS

#### 2.01 Pre-Bid Investigations Required

- A. Prior to and as a condition of submitting a Bid and executing Document 00 5200 (Agreement), Contractor shall make reasonable efforts to investigate fully the Work of the Contract. Contractor shall visit the Site, examine thoroughly and understand fully the nature and extent of the Contract Documents, Work, Site, locality, actual conditions and as-built conditions.
- B. Contractor's investigation shall include, without limitation, requesting and thoroughly examining of all reports of exploration and tests of subsurface conditions, as-built drawings, drawings, product specification(s) or reports, made available by City for contracting purposes or during Contractor's pre-bid investigations, of existing above ground and (to the extent applicable) below ground conditions (together, "Existing Conditions Data"), including, as applicable, Underground Facilities, geotechnical data, as-built data, utility surveys, record documents of all types, hazardous materials surveys, or similar materials which may appear or be referenced in the Project Manual or the in the Contract Documents, and all local conditions, and federal, state and local laws and regulations that in any manner may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Contractor and safety precautions and programs incident thereto.
- C. Contractor's investigations shall consider fully the fact that Existing Conditions Data is in many cases based on information furnished to City by others (e.g., the prior owner or builders), and that due to their age or their chain of custody since preparation, may not meet current industry standards for accuracy. Contractor shall also: (i.) provide City with prompt written notice of all

conflicts, errors, ambiguities, or discrepancies of any type, that it discovered in or among the Contract Documents and the Existing Conditions Data, and (ii.) subject to City's approval, conduct any such additional or supplementary examinations, investigations, explorations, tests, studies and data compilations, concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site or otherwise, which Contractor may deem necessary in order to perform and furnish the Work in accordance with the terms and conditions of Contract Documents.

- D. During performance of the Contract, Contractor will be charged with knowledge of all information that it should have learned in performing these pre-bid investigations and other obligations, and shall not be entitled to Change Orders (time or compensation) due to any information, error, inconsistency, omission, or conditions that Contractor should have known as a part of this Work. Contractor shall be responsible for the resultant losses, including, without limitation, the cost of correcting Defective Work.

## **2.02 Limited Reliance Permitted On City's Existing Conditions Data**

- A. Regarding aboveground and as-built conditions shown on the Contract Documents or supplied by City, such information has been compiled in good faith, however, City does not expressly or impliedly warrant or represent that such information is correctly shown or indicated, or otherwise complete for construction purposes. Contractor must independently verify such information as part of its pre-bid investigations, and where conditions are not reasonably verifiable or discrepancies are identified, bring such matters to City's attention through written question issued during the bid period. In executing Document 00 5200 (Agreement), Contractor shall rely on the results of its own independent investigation and shall not rely on City-supplied information regarding aboveground conditions and as-built conditions, and Contractor shall accept full responsibility for its verification work sufficient to complete the Work as intended.
- B. Regarding subsurface conditions other than Underground Facilities shown on the Contract Documents or otherwise supplied by City, Contractor may rely only upon the general accuracy of actual reported depths, actual reported character of materials, actual reported soil types, actual reported water conditions, or actual obstructions shown or indicated in the Contract Documents. City is not responsible for the completeness of any subsurface condition information, Contractor's conclusions or opinions drawn from any subsurface condition information, or subsurface conditions that are not specifically shown. (For example, City is not responsible for soil conditions in areas contiguous to areas where a subsurface condition is shown.)

## **2.03 Pre-Bid Investigation Requirements For Excavation And Utilities Relocation Projects**

- A. As part of its pre-bid investigations for Projects involving excavation and/or relocation of existing utilities, Contractor shall make reasonable efforts to verify information regarding Underground Facilities, including but not limited to, requesting additional information or verification of information as necessary.
- B. Because of the nature and location of City and the Project, the existence of Underground Facilities is deemed inherent in the Work of the Contract, as is the fact that Underground Facilities are not always accurately shown or completely shown on as-built records, both as to their depth and location. Contractor shall, therefore, take care to note the existence and potential existence of Underground Facilities, in particular, above and below grade structures, drainage lines, storm drains, sewers, water, gas, electrical, chemical, hot water, and other similar items and utilities. Contractor shall carefully consider all supplied information, request additional information Contractor may deem necessary, and visually inspect the Site for above ground indications of Underground Facilities (such as, for example not by way of limitation, the existence of existing service laterals, appurtenances or other types of utilities, indicated by the presence of an underground transmission main or other visible facilities, such as buildings, new asphalt, meters and junction boxes, on or adjacent to the Site). Contractor shall also consider local underground conditions and typical practices for Underground Facilities, either through its own direct knowledge or through its subcontractors, and fully consider this knowledge in assessing the existing information and the reasonableness of its reliance.

**ARTICLE 3 – SUBCONTRACTORS****3.01 Subcontractor Listing Law**

- A. Contractor shall comply with the Subcontractor Listing law, California Public Contract Code §§4101 et seq. Contractor shall not substitute any other person or firm in place of any Subcontractor listed in the Bid except as may be allowed by law.
- B. Subcontractors shall not assign or transfer their subcontracts or permit them to be performed by any other contractor without City's written approval. At City's request, Contractor shall provide City with a complete copy of all executed subcontracts or final commercial agreements with Subcontractors and/or suppliers.

**3.02 Subcontracts**

- A. Subcontract agreements shall preserve and protect the rights of City under the Contract Documents so that subcontracting will not prejudice such rights. To the extent of the Work to be performed by a Subcontractor, Contractor shall require the Subcontractor's written agreement (1) to be bound to the terms of Contract Documents and (2) to assume vis-à-vis Contractor all the obligations and responsibilities that Contractor assumes toward City under the Contract Documents. (These agreements include for example, and not by way of limitation, all warranties, claims procedures and rules governing submittals of all types to which Contractor is subject under the Contract Documents.)
- B. Contractor shall provide for the assignment to City of all rights any Subcontractor (of any tier) may have against any manufacturer, supplier, or distributor for breach of warranties and guarantees relating to the Work performed by the Subcontractor under the Contract Documents. Subcontracts shall provide and acknowledge City as an intended third-party beneficiary of each subcontract and supply contract (of any tier).

**ARTICLE 4 – DRAWINGS AND SPECIFICATIONS****4.01 Intent Of Drawings And Specifications**

- A. Contractor shall interpret words or phrases used to describe Work (including services), materials, or equipment that have well-known technical or construction industry or trade meaning in accordance with that meaning. Drawings' intent specifically includes the intent to depict construction that complies with all applicable laws, codes and standards.
- B. As part of the "Work," Contractor shall provide all labor, materials, equipment, machinery, tools, facilities, services, employee training and testing, hoisting facilities, Shop Drawings, storage, testing, security, transportation, disposal, the securing of all necessary or required field dimensions, the cutting or patching of existing materials, notices, permits, documents, reports, agreements and any other items required or necessary to timely and fully complete Work described and the results intended by Contract Documents and, in particular, Drawings and Specifications. Divisions and Specification Sections and the identification on any Drawings shall not control Contractor in dividing Work among Subcontractors or suppliers or delineating the Work to be performed by any specific trade.
- C. Contractor shall perform reasonably implied parts of Work as "incidental work" although absent from Drawings and Specifications. Incidental work includes any work not shown on Drawings or described in Specifications that is necessary or normally or customarily required as a part of the Work shown on Drawings or described in Specifications. Incidental work includes any work necessary or required to make each installation satisfactory, legally operable, functional, and consistent with the intent of Drawings and Specifications or the requirements of Contract Documents. Contractor shall perform incidental work without extra cost to City. Incidental work shall be treated as if fully described in Specifications and shown on Drawings, and the expense of incidental work shall be included in price Bid and Contract Sum.

**4.02 Checking Of Drawings And Specifications**

- A. Before undertaking each part of Work, Contractor shall carefully study and compare Contract Documents and check and verify pertinent figures shown in the Contract Documents and all



applicable field measurements. Contractor shall be responsible for any errors that might have been avoided by such comparison. Figures shown on Drawings shall be followed; Contractor shall not scale measurements. Contractor shall promptly report to City, in writing, any conflict, error, ambiguity or discrepancy that Contractor may discover. Contractor shall obtain a written interpretation or clarification from City before proceeding with any Work affected thereby. Contractor shall provide City with a follow-up correspondence every ten calendar days until it receives a satisfactory interpretation or clarification.

#### **4.03 Interpretation Of Drawings And Specifications**

- A. A typical or representative detail on Drawings shall constitute the standard for workmanship and material throughout corresponding parts of Work. Where necessary, and where reasonably inferable from Drawings, Contractor shall adapt such representative detail for application to such corresponding parts of Work. The details of such adaptation shall be subject to prior approval by City. Repetitive features shown in outline on Drawings shall be in exact accordance with corresponding features completely shown.
- B. Should any discrepancy appear or any misunderstanding arise as to the import of anything contained in Drawings and Specifications, or should Contractor have any questions or requests relating to Drawings or Specifications, Contractor shall refer the matter to City, in writing, with a copy to the Architect/Engineer. City will issue with reasonable promptness written responses, clarifications or interpretations as City may determine necessary, which shall be consistent with the intent of and be reasonably inferable from Contract Documents. Such written clarifications or interpretations shall be binding upon Contractor. If Contractor believes that a written response, clarification or interpretation justifies an adjustment in the Contract Sum or Contract Time, Contractor shall give City prompt written notice. If the parties are unable to agree to the amount or extent of the adjustment, if any, then Contractor shall perform the Work in conformance with City's response, clarification, or interpretation and may make a written claim for the adjustment as provided in Article 12.
- C. The following general specifications shall apply wherever in the Specifications, or in any directions given by City in accordance with or supplementing Specifications, it is provided that Contractor shall furnish materials or manufactured articles or shall do Work for which no detailed specifications are shown. Materials or manufactured articles shall be of the best grade, in quality and workmanship, obtainable in the market from firms of established good reputation. If not ordinarily carried in stock, the materials or manufactured articles shall conform to industry standards for first class materials or articles of the kind required, with due consideration of the use to which they are to be put. Work shall conform to the usual standards or codes, such as those cited herein, for first class work of the kind required. Contractor shall specify in writing to City the materials to be used or Work to be performed under this Paragraph ten Business Days prior to furnishing such materials or performing such Work.

#### **4.04 Use Of Drawings And Specifications.**

- A. Drawings, Specifications and other Contract Documents were prepared for use for Work of Contract Documents only. No part of Contract Documents shall be used for any other construction or for any other purpose except with the written consent of City. Any unauthorized use of Contract Documents is prohibited and at the sole liability of the user.

### **ARTICLE 5 – COMMENCEMENT OF THE WORK**

#### **5.01 Submission Of Required Schedules**

- A. Contractor shall submit to City in draft for review and discussion at the Preconstruction Conference, and in final prior to the first payment application, the following schedules:
  - 1. Schedule of Values
  - 2. Progress Schedule, and
  - 3. Schedule of Submittals.
- B. No progress payment shall be due or owing to Contractor until such schedules are submitted to and acceptable to City and/or Architect/Engineer as meeting the requirements of the Contract

Documents. In City's sole discretion, City may elect to instead withhold a portion of any progress payment for unacceptable compliance with contract requirements for such schedules.

- C. City's acceptance of Contractor's schedules will not create any duty of care or impose on City any responsibility for the sequencing, scheduling or progress of Work nor will it interfere with or relieve Contractor from Contractor's full responsibility therefore.

#### **5.02 Commencement Date Of Contract Time**

- A. The Contract Time will commence to run on the 60th Day after the issuance of the Notice of Award or, if a Notice to Proceed is given, on the date indicated in the Notice to Proceed.
- B. City may give a Notice to Proceed at any time within 60 calendar days after the Notice of Award. Contractor shall not do any Work at the Site prior to the date on which the Contract Time commences to run.

### **ARTICLE 6 – CONTRACTOR'S ORGANIZATION AND EQUIPMENT**

#### **6.01 Contractor's Legal Address**

- A. Address and facsimile number given in Contractor's Bid are hereby designated as Contractor's legal address and facsimile number. Contractor may change its legal address and facsimile number by notice in writing, delivered to City, which in conspicuous language advises City of a change in legal address or facsimile number, and which City accepts in writing. Delivery to Contractor's legal address or depositing in any post office or post office box regularly maintained by the United States Postal Service, in a wrapper with postage affixed, directed to Contractor at legal address, or of any drawings, notice, letter or other communication, shall be deemed legal and sufficient service thereof upon Contractor. Facsimile to Contractor's designated facsimile number of any letter, memorandum, or other communication on standard or legal sized paper, with proof of facsimile transmission, shall be deemed legal and sufficient service thereof upon Contractor.

#### **6.02 Contractor's Superintendents Or Forepersons**

- A. Contractor shall at all times be represented on Site by one or more superintendents or forepersons authorized and competent to receive and carry out any instructions that City may give, and shall be liable for faithful observance of instructions delivered to Contractor or to authorized representative or representatives on Site.

#### **6.03 Proficiency In English**

- A. Supervisors, security guards, safety personnel and employees who have unescorted access to the Site shall possess proficiency in the English language in order to understand, receive and carry out oral and written communications or instructions relating to their job functions, including safety and security requirements.

#### **6.04 Contractor's And Subcontractors' Employees**

- A. Contractor shall employ, and shall permit its Subcontractors to employ, only competent and skillful personnel to do Work. If City notifies Contractor that any of its employees, or any of its Subcontractors' employees on Work is incompetent, unfaithful, disorderly or profane, or fails to observe customary standards of conduct or refuses to carry out any provision of the Contract Documents, or uses threatening or abusive language to any person on Work representing City, or violates sanitary rules, or is otherwise unsatisfactory, and if City requests that such person be discharged from Work, then Contractor or its Subcontractor shall immediately discharge such person from Work and the discharged person shall not be re-employed on the Work except with consent of City.

#### **6.05 Contractor's Use Of The Site**

- A. Contractor shall not make any arrangements with any person to permit occupancy or use of any land, structure or building within the limits of the Work, for any purpose whatsoever, either with or without compensation, in conflict with any agreement between City and any owner, former owner

or tenant of such land, structure or buildings. Contractor may not occupy City-owned property outside the limit of the Work as indicated on the Drawings unless it obtains prior approval from City.

#### **6.06 Contractor's Site Office**

- A. Unless expressly provided otherwise in the Contract Documents, Contractor shall provide a site office staffed by a resident project manager or job superintendent.

### **ARTICLE 7 – CITY'S ADMINISTRATION OF WORK**

#### **7.01 City's Representative(s)**

- A. City's Representative(s) will have limited authority to act on behalf of City as set forth in the Contract Documents.
- B. Except as otherwise provided in these Contract Documents or subsequently identified in writing by City, City will issue all communications to Contractor through City's Representative, and Contractor shall issue all communications to City through City's Representative in a written document delivered to City.
- C. Should any direct communications between Contractor and City's consultants, architects or engineers not identified in Article 2 of Document 00 5200 (Agreement) occur during field visits or by telephone, Contractor shall immediately confirm them in a written document copied to City.

#### **7.02 City's Observation Of The Work**

- A. Work shall be performed under City's general observation and administration. Contractor shall comply with City's directions and instructions in accordance with the terms of Contract Documents, but nothing contained in these General Conditions shall be taken to relieve Contractor of any obligations or liabilities under the Contract Documents. City's failure to review or, upon review, failure to object to any aspect of Work reviewed, shall not be deemed a waiver or approval of any non-conforming aspect of Work.
- B. Subject to those rights specifically reserved in the Contract Documents, City will not supervise, or direct, or have control over, or be responsible for, Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or Contractor's failure to comply with laws and regulations applicable to the furnishing or performance of Work. City will not be responsible for Contractor's failure to perform or furnish the Work in accordance with Contract Documents.

#### **7.03 Architect/Engineer's Observation Of Work**

- A. City may engage an Architect/Engineer, an independent consultant or Project Manager (collectively for purposes of this Paragraph, "Project Manager/Architect") to assist in administering the Work. If so engaged, Project Manager/Architect will advise and consult with City, but will have authority to act on behalf of City only to extent provided in the Contract Documents or as set forth in writing by City. Project Manager/Architect will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with Work. Project Manager/Architect will not be responsible for or have control over the acts or omissions of Contractor, Subcontractors or their agents or employees, or any other persons performing Work.
- B. Project Manager/Architect may review Contractor's Submittals, such as Shop Drawings, Product Data, and Samples, but only for conformance with design concept of Work and with information given in the Contract Documents.
- C. Project Manager/Architect may visit the Site at intervals appropriate to stage of construction to become familiar generally with the progress and quality of Work and to determine in general if Work is proceeding in accordance with Contract Documents. Based on its observations, Project Manager/Architect may recommend to City that it disapproves or rejects Work that Project Manager/Architect believes to be Defective or will not produce a complete Project that conforms to Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by Contract Documents. City will also have authority

to require special inspection or testing of Work, whether or not the Work is fabricated, installed or completed.

- D. Project Manager/Architect may conduct inspections to recommend to City the dates that Contractor has achieved Substantial Completion and Final Acceptance, and will receive and forward to City for review written warranties and related documents required by Contract Documents.

#### **7.04 Owner's And Architect/Engineer's Exercise Of Contract Responsibilities**

- A. City, Project Manager, Architect/Engineer and all City's representatives, in performing their duties and responsibilities under the Contract Documents, accept no duties, responsibilities or duty of care, nor may the same be implied or inferred, towards Contractor, any Subcontractor, sub-Subcontractor or supplier, except those set forth expressly in the Contract Documents.

#### **7.05 City's Right Of Access To The Work**

- A. During performance of Work, City and its agents, consultants, and employees may at any time enter upon Work, shops or studios where any part of the Work may be in preparation, or factories where any materials for use in Work are being or are to be manufactured, and Contractor shall provide proper and safe facilities for this purpose, and shall make arrangements with manufacturers to facilitate inspection of their processes and products to such extent as City's interests may require. Other contractors performing work for City may also enter upon Work for all purposes required by their respective contracts. Subject to the rights reserved in the Contract Documents, Contractor shall have sole care, custody, and control of the Site and its Work areas.

#### **7.06 City's Right Of Separate Construction**

- A. City may perform with its own forces, construction or operations related to the Project, or the Site during Contractor's operations. City may also award separate contracts in connection with other portions of the Project or other construction or operations, on the Site or areas contiguous to the Site, under conditions similar to these Contract Documents, or may have utility owners perform other work.
- B. Contractor shall adjust its schedule and fully coordinate with and shall afford all other contractors, utility districts and City (if City is performing work with its own forces), proper and safe access to the Site, and reasonable opportunity for the installation and storage of their materials. Contractor shall ensure that the execution of its Work properly connects and coordinates with others' work, do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work, and shall cooperate with them to facilitate the progress of the Work.
- C. To the extent that any part of Contractor's Work is to interface with work performed or installed by other contractors or utility owners, Contractor shall inspect and measure the in-place work. Contractor shall promptly report to City in writing any defect in in-place work that will impede or increase the cost of Contractor's interface unless corrected.

### **ARTICLE 8 – CONTRACTOR'S PROSECUTION AND PROGRESS OF THE WORK**

#### **8.01 Contractor To Supervise The Work**

- A. Subject to those rights specifically reserved in the Contract Documents, Contractor shall supervise, direct, have control over, and be responsible for, Contractor's means, methods, techniques, sequences or procedures of construction, safety precautions and programs incident thereto, and compliance with laws and regulations applicable to the furnishing or performance of Work.
- B. Contractor shall keep on the Site at all times during Work progress a competent resident Superintendent, who shall not be replaced without City's express written consent. The Superintendent shall be Contractor's representative at the Site and shall have complete authority to act on behalf of Contractor. All communications to and from the Superintendent shall be as binding as if given to or by Contractor.
- C. Contractor shall supervise, inspect, and direct Work competently and efficiently, devoting the

attention and applying such personal skills and expertise as may be required and necessary to perform Work in accordance with Contract Documents. Contractor shall be solely responsible for and have control and charge of construction means, methods, techniques, sequences and procedures, safety precautions and programs in connection with the Work. Contractor shall be responsible to see that the completed Work complies accurately with Contract Documents.

- D. Contractor is fully responsible for Contractor's own acts and omissions. Contractor is responsible for all acts and omissions of its Subcontractors, suppliers, and other persons and organizations performing or furnishing any of the Work, labor, materials, or equipment under a direct or indirect contract with Contractor.
- E. Contractor shall conduct monthly Contractor Safety Committee meetings, and weekly toolbox safety talks.

### **8.02 Contractor To Maintain Cost Data**

- A. Contractor shall maintain full and correct information as to the number of workers employed in connection with each subdivision of Work, the classification and rate of pay of each worker in form of certified payrolls, the cost to Contractor of each class of materials, tools and appliances used by Contractor in Work, and the amount of each class of materials used in each subdivision of Work. Contractor shall provide City with monthly summaries of this information. If Contractor maintains or is capable of generating summaries or reports comparing actual Project costs with Bid estimates or budgets, Contractor shall provide City with a copy of such report upon City's request.
- B. Contractor shall maintain daily job reports recording all significant activity on the job, including the number of workers on Site, Work activities, problems encountered and delays. Contractor shall provide City with copies for each Day Contractor works on the Project, to be delivered to City either the same Day or the following morning before starting work at the Site. Contractor shall take pre-construction and monthly progress photographs of all areas of the Work. Contractor shall maintain copies of all correspondence with Subcontractors and records of meetings with Subcontractors.
- C. City shall have the right to audit and copy Contractor's books and records of any type, nature or description relating to the Project (including but not limited to financial records reflecting in any way costs claimed on the Project), and to inspect the Site, including Contractor's trailer, or other job Site office, and this requirement shall be contained in the subcontracts of Subcontractors working on Site. By way of example, City shall have the right to inspect and obtain copies of all Contract Documents, planning and design documents, Bid proposal and negotiation documents, cost records and job cost variance reports, design modification proposals, value engineering or other cost reduction proposals, revisions made to the original design, job progress reports, photographs, and as-built drawings maintained by Contractor. City and any other applicable governmental entity shall have the right to inspect all information and documents maintained hereunder at any time during the Project and for a period of five years following Final Completion, in accordance with the provisions of Section 8546.7 of the California Government Code. This right of inspection shall not relieve Contractor of its duties and obligations under the Contract Documents. This right of inspection shall be specifically enforceable in a court of law, either independently or in conjunction with enforcement of any other rights in the Contract Documents.

### **8.03 Contractor To Supply Sufficient Workers And Materials**

- A. Unless otherwise required by City under the terms of Contract Documents, Contractor shall at all times keep on the Site materials and employ qualified workers sufficient to prosecute Work at a rate and in a sequence and manner necessary to complete Work within the Contract Time. This obligation shall remain in full force and effect notwithstanding disputes or claims of any type.
- B. At any time during progress of Work should Contractor directly or indirectly (through Subcontractors) refuse, neglect, or be unable to supply sufficient materials or employ qualified workers to prosecute the Work as required, then City may require Contractor to accelerate the Work and/or furnish additional qualified workers or materials as City may consider necessary, at no cost to City. If Contractor does not comply with the notice within three Business Days of date of service thereof, City shall have the right (but not a duty) to provide materials and qualified

workers to finish the Work or any affected portion of Work, as City may elect. City may, at its discretion, exclude Contractor from the Site, or portions of the Site or separate work elements during the time period that City exercises this right. City will deduct from moneys due or which may thereafter become due under the Contract Documents, the sums necessary to meet expenses thereby incurred and paid to persons supplying materials and doing Work. City will deduct from funds or appropriations set aside for purposes of Contract Documents the amount of such payments and charge them to Contractor as if paid to Contractor. Contractor shall remain liable for resulting delay, including liquidated damages and indemnification of City from claims of others.

- C. Exercise by City of the rights conferred upon City in this subparagraph is entirely discretionary on the part of City. City shall have no duty or obligation to exercise the rights referred to in this subparagraph and its failure to exercise such rights shall not be deemed an approval of existing Work progress or a waiver or limitation of City's right to exercise such rights in other concurrent or future similar circumstances. (The rights conferred upon City under this subparagraph are, like all other such rights, cumulative to City's other rights under any provision of the Contract Documents.)

#### **8.04 Contractor To Maintain Project Record Documents**

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Contract Modifications, Change Orders, Work Directives, Force Account orders, and written interpretations and clarifications in good order and annotated to show all as-built changes made during construction. These Project Record Documents, together with all approved Samples and a counterpart of all approved Shop Drawings, shall be maintained and available to City for reference. Upon completion of the Work, Contractor shall deliver to City, the Project Record Documents, Samples and Shop Drawings and as-built drawings.
- B. Throughout Contractor's performance of the Work of the Project, Contractor shall maintain construction records to include: shop drawings; product data/material data sheets; samples; submittal; purchases; materials; equipment; inspections; applicable handbooks; applicable codes and standards; maintenance and operating manuals and instructions; RFI Log; Submittal Log; other related documents and revisions which arise out of the Construction Contracts. Contractor shall maintain records of principal building layout lines, elevations for the bottom of footings, floor levels, and key site elevations (certified by a qualified surveyor or professional engineer). Contractor shall make all records available to City. At the completion of the Project, Contractor shall deliver all such records to the City to have a complete set of record as-built drawings.

#### **8.05 Contractor To Not Disrupt City Operation**

- A. Contractor shall schedule and execute all Work in a manner that does not interfere with or disrupt City operations, including but not limited to, parking, utilities (electricity, gas, water), noise, access by employees and administration, access by vendors, physicians, patients and any other person or entity using City facilities or doing business with City. Contractor shall produce and supply coordination plans and requests to City, following City procedures, for all necessary interference of construction with City, which City will reasonably cooperate with.

#### **8.06 Contractor To Provide Temporary Facilities And Controls**

- A. Unless expressly provided otherwise in the Contract Documents, Contractor shall provide all temporary utilities (including without limitation electricity, water, natural gas), lighting, heating, cooling and ventilating devices, telephone, sanitary facilities, barriers, fences and enclosures, tree and plant protection, fire protection, pollution, erosion, Storm Water Pollution Prevention controls, noise and traffic control, and any other necessary services required for construction, testing or completion of the Work.

### **ARTICLE 9 – WARRANTY, GUARANTY, AND INSPECTION OF WORK**

#### **9.01 Warranty And Guaranty**

- A. General Representations and Warranties: Contractor represents and warrants that it is and will

be at all times fully qualified and capable of performing every Phase of the Work and to complete Work in accordance with the terms of Contract Documents. Contractor warrants that all construction services shall be performed in accordance with generally accepted professional standards of good and sound construction practices and all requirements of Contract Documents. Contractor warrants that Work, including but not limited to each item of materials and equipment incorporated therein, shall be new, of suitable grade of its respective kind for its intended use, and free from defects in design, engineering, materials, construction and workmanship.

Contractor warrants that Work shall conform in all respects with all applicable requirements of federal, state and local laws, applicable construction codes and standards, licenses, and permits, Drawings and Specifications and all descriptions set forth therein, and all other requirements of Contract Documents. Contractor shall not be responsible, however, for the negligence of others in the specification of specific equipment, materials, design parameters and means or methods of construction where that is specifically shown and expressly required by Contract Documents.

- B. **Extended Guarantees:** Any guarantee exceeding one year provided by the supplier or manufacturer of any equipment or materials used in the Project shall be extended for such term. Contractor expressly agrees to act as co-guarantor of such equipment and materials and shall supply City with all warranty and guarantee documents relative to equipment and materials incorporated in the Project and guaranteed by their suppliers or manufacturers.
- C. **Environmental and Toxics Warranty:** The covenants, warranties and representations contained in this Paragraph are effective continuously during Contractor's Work on the Project and following cessation of labor for any reason including, but not limited to, Project completion. Contractor covenants, warrants and represents to City that:
  - 1. To Contractor's knowledge after due inquiry, no lead or Asbestos-containing materials were installed or discovered in the Project at any time during Contractor's construction thereof. If any lead or Asbestos-containing materials were discovered, Contractor made immediate written disclosure to City.
  - 2. To Contractor's knowledge after due inquiry, no electrical transformers, light fixtures with ballasts or other equipment containing PCBs are or were located on the Project at any time during Contractor's construction thereof.
  - 3. To Contractor's knowledge after due inquiry, no storage tanks for gasoline or any other toxic substance are or were located on the Project at any time during Contractor's construction thereof. If any such materials were discovered, Contractor made immediate written disclosure to City.
  - 4. Contractor's operations concerning the Project are and were not in violation of any applicable environmental federal, state, or local statute, law or regulation dealing with hazardous materials substances or toxic substances and no notice from any governmental body has been served upon Contractor claiming any violation of any such law, ordinance, code or regulation, or requiring or calling attention to the need for any Work, repairs, construction, alteration, or installation on or in connection with the Project in order to comply with any such laws, ordinances, codes, or regulations, with which Contractor has not complied. If there are any such notices with which Contractor has complied, Contractor shall provide City with copies thereof.

## **9.02 Inspection Of Work**

- A. Work and materials, and manufacture and preparation of materials, from beginning of construction until Final Completion and acceptance of Work, shall be subject to inspection and rejection by City, its agents, representatives or independent contractors retained by City to perform inspection services, or governmental agencies with jurisdictional interests. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and program so that they may comply therewith as applicable. Upon request or where specified, City shall be afforded access for inspection at the source of supply, manufacture or assembly of any item of material or equipment, with reasonable accommodations supplied for making such inspections.
- B. Contractor shall furnish, in such quantities and sizes as may be required for proper examination and tests, Samples or test specimens of all materials to be used or offered for use in connection

with Work. Contractor shall prepare Samples or test specimens at its expense and furnish them to City. Contractor shall submit all Samples in ample time to enable City to make any necessary tests, examinations, or analyses before the time it is desired to incorporate the material into the Work.

- C. Contractor shall give City timely notice of readiness of Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- D. If applicable laws or regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, and furnish City with the required certificates of inspection, or approval. City will pay the cost of initial testing and Contractor shall pay all costs in connection with any follow-up or additional testing. Contractor shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for the acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.
- E. If Contractor covers any Work, or the work of others, prior to any required inspection, test or approval without written approval of City, Contractor shall uncover the Work at City's request. Contractor shall bear the expense of uncovering Work and replacing Work. In any case where Contractor covers Work contrary to City's request, Contractor shall uncover Work for City's observation or inspection at City's request. Contractor shall bear the cost of uncovering Work.
- F. Whenever required by City, Contractor shall furnish tools, labor and materials necessary to make examination of Work that may be completed or in progress, even to extent of uncovering or taking down portions of finished Work. Should Work be found unsatisfactory, cost of making examination and of reconstruction shall be borne by Contractor. If Work is found to be satisfactory, City, in manner herein prescribed for paying for alterations, Modifications, and extra Work, except as otherwise herein specified, will pay for examination.
- G. Inspection of the Work by or on behalf of City, or City's failure to do so, shall not under any circumstances be deemed a waiver or approval of any non-conforming aspect of the Work. Contractor shall have an absolute duty, in the absence of a written Change Order signed by City, to perform Work in conformance with the Contract Documents and to immediately correct Defective Work immediately upon Contractor's knowledge.
- H. Any inspection, evaluation, or test performed by or on behalf of City relating to the Work is solely for the benefit of City, and shall not be relied upon by Contractor. Contractor shall not be relieved of the obligation to perform Work in accordance with the Contract Documents, nor relieved of any guaranty, warranty, or other obligation, as a result of any inspections, evaluations, or tests performed by City, whether or not such inspections, evaluations, or tests are permitted or required under the Contract Documents. Contractor shall be solely responsible for testing and inspecting Work already performed to determine whether such Work is in proper condition to receive later Work.

### **9.03 Correction Of Defective Work**

- A. City may direct Contractor to correct any Defective Work or remove it from the Site and replace it with Work that is not Defective and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting from the correction or removal. Contractor shall be responsible for any and all claims, costs, losses and damages caused by or resulting from such correction or removal. A Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Contract Sum. If the parties are unable to agree to the amount of an appropriate decrease in the Contract Sum, City may decide the proper amount or, in its discretion may elect to leave the Contract Sum unchanged and deduct from monies due Contractor, all such claims, costs, losses and damages caused by or resulting from the correction or removal. If Contractor disagrees with City's calculations, it may make a claim as provided in Article 12 of this Document 00 7200. City's rights under this Paragraph shall be in addition to any other rights it may have under the Contract Documents or by law.



- B. If Contractor fails to supply sufficient skilled workers, suitable materials or equipment, or to furnish or perform the Work in such a way that the completed Work will conform to Contract Documents, City may order Contractor to replace any such Defective Work, or stop any portion of Work to permit City (at Contractor's expense) to replace such Defective Work. These City rights are entirely discretionary on the part of City, and shall not give rise to any duty on the part of City to exercise the rights for the benefit of Contractor or any other party.

#### **9.04 Acceptance And Correction Of Defective Work By City**

- A. City may in its sole discretion elect to accept Defective Work. Contractor shall pay all claims, costs, losses and damages attributable to City's evaluation of and determination to accept such Defective Work. If City accepts any Defective Work prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Contract Sum. If the parties are unable to agree to the amount of an appropriate decrease in the Contract Sum, City may deduct from monies due Contractor, all claims, costs, losses, damages, expenses and liabilities attributable to the Defective Work. If Contractor disagrees with City's calculations, Contractor may make a claim as provided in Article 12 of this Document 00 7200. If City accepts any Defective Work after final payment, Contractor shall pay to City, an appropriate amount as determined by City.
- B. City may correct and remedy deficiency if, after five calendar days' written notice to Contractor, Contractor fails to correct Defective Work or to remove and replace rejected Work; or provide a plan for correction of Defective Work acceptable to City; or perform Work in accordance with Contract Documents. In connection with such corrective and remedial action, City may exclude Contractor from all or part of the Site; take possession of all or part of Work and suspend Contractor's Work related thereto; take possession of all or part of Contractor's tools, appliances, construction equipment and machinery at the Site; and incorporate in Work any materials and equipment stored at the Site or for which City has paid Contractor but which are stored elsewhere. Contractor shall allow City, its representatives, agents, employees, and other contractors and Project Manager/Architect's consultants' access to the Site to enable City to exercise the rights and remedies under this Paragraph. Contractor shall be responsible for all claims, costs, losses, damages, expenses and liabilities incurred or sustained by City in exercising such rights and remedies. A Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to Work and the Contract Sum. If the parties are unable to agree to the amount of an appropriate decrease in the Contract Sum, City may deduct from moneys due Contractor, all claims, costs, losses and damages caused by or resulting from the correction or removal. If Contractor disagrees with City's calculations, Contractor may make a claim as provided in Article 12.

#### **9.05 Rights Upon Inspection, Correction Or Acceptance**

- A. Contractor shall not be allowed an extension of Contract Time because of any delay in the performance of Work attributable to the exercise by City of its rights and remedies under this Article. Where City exercises its rights under this Article, it retains and may still exercise all other rights it has by law or under the Contract Documents including, but not limited to, the right to terminate Contractor's right to proceed with the Work under the Contract Documents for cause and/or make a claim or back charge where a Change Order cannot be agreed upon.
- B. Inspection by City or its authorized agents or representatives shall not relieve Contractor of its obligation to have furnished material and workmanship in accordance with Contract Documents. Payment for Work completed through periodic progress payments, final payment or otherwise shall not operate to waive City's right to require full compliance with Contract Documents and shall in no way be deemed as acceptance of any defective Work paid therefor. Contractor's obligation to complete the Work in accordance with Contract Documents shall be absolute, unless City agrees otherwise in writing.

#### **9.06 Proof Of Compliance Of Contract Provisions**

- A. In order that City may determine whether Contractor has complied or is complying with requirements of Contract Documents not readily enforceable through inspection and tests of

Work and materials, Contractor shall at any time, when requested, submit to City properly authenticated documents or other satisfactory proofs of compliance with all applicable requirements.

- B. Before commencing any portion of Work, Contractor shall inform City in writing as to time and place at which Contractor wishes to commence Work, and nature of Work to be done, in order that proper provision for inspection of Work may occur, and to assure measurements necessary for record and payment. Information shall be given to City a reasonable time in advance of time at which Contractor proposes to begin Work, so that City may complete necessary preliminary work without inconvenience or delay to Contractor.

#### **9.07 Correction Period And Project Warranty Period:**

- A. If within one year after the date of Final Acceptance, or such longer period of time as may be prescribed by laws, regulations or by the terms of Contract Documents or any extended warranty or guaranty, any Work (completed or incomplete) is found to be Defective, Contractor shall promptly without cost to City and in accordance with City's written instructions, correct such Defective Work. Contractor shall remove any Defective Work rejected by City and replace it with Work that is not Defective, and satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If Contractor fails to promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, City may have the Defective Work corrected or the rejected Work removed and replaced. Contractor shall pay for all claims, costs, losses and damages caused by or resulting from such removal and replacement. Where Contractor fails to correct Defective Work, or defects are discovered outside the correction period, City shall have all rights and remedies granted by law.
- B. In special circumstances where a part of the Work is occupied or a particular item of equipment is placed in continuous service before Final Acceptance of all the Work, the correction period for that part of Work or that item may start to run from an earlier date if so provided by Change Order.
- C. Where Defective Work or rejected Work (and damage to other Work resulting therefrom) has been corrected, removed, or replaced under this provision after the commencement of the correction period, the correction period hereunder with respect to such Work shall be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

#### **9.08 No Waiver**

- A. Neither recordation of Final Acceptance nor final certificate for payment nor provision of the Contract nor partial or entire use or occupancy of premises by City shall constitute acceptance of Work not done in accordance with Contract Documents nor relieve Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship.
- B. If, after installation, operation, or use of materials or equipment to be provided under Contract proves to be unsatisfactory to City, City shall have right to operate and use materials or equipment until said materials and equipment can, without damage to City, be taken out of service for correction or replacement. Period of use of Defective materials or equipment pending correction or replacement shall in no way decrease guarantee period required for acceptable corrected or replaced items of materials or equipment.
- C. Nothing in the Contract Documents shall be construed to limit, relieve, or release Contractor's, Subcontractors', and equipment suppliers' liability to City for damages sustained as result of latent defects in materials or equipment caused by negligence of Contractor, its agents, suppliers, employees, or Subcontractors.

### **ARTICLE 10 – MODIFICATIONS OF CONTRACT DOCUMENTS**

#### **10.01 City's Right To Direct Changed Work.**

- A. City may, without notice to the sureties and without invalidating the Contract, make changes in the Work ("Changed Work"), including without limitation: alterations, deviations, additions to, or

deletions from Contract Documents; increase or decrease the quantity of any item or portion of the Work; expand, reduce or otherwise change the Contract Time; delete any item or portion of the Work; and require extra Work. Contractor shall perform such Work under applicable provisions of the Contract Documents, unless specifically provided otherwise at the time the change is ordered. In the case of any ordered extra Work, City reserves the right to furnish all or portions of associated labor, material, and equipment, which Contractor shall accept and use without payment for costs, markup, profit, or otherwise for such City-furnished labor, materials, and equipment.

- B. If Changed Work is of such a nature as to increase or decrease the time or cost of any part of Work, price fixed in Contract shall be increased or decreased by amount as the Contractor and City may agree upon as reasonable and proper allowance for increase or decrease in cost of Work using the cost guidelines set forth in this Article, and absent such agreement, then as City may direct (with Contractor retaining its rights under Article 12 herein).

### 10.02 Required Documentation For Changed Work

- A. Changes affecting the Contract Time or Contract Sum of the Work shall be set forth in a written Change Order or Change Directive that shall specify:
  1. The Work performed in connection with the change to be made;
  2. The amount of the adjustment of the Contract Sum, if any, and the basis for compensation for the Work ordered; and
  3. The extent of the adjustment in the Contract Time, if any.
- B. A Change Order or Change Directive will become effective when signed by City, notwithstanding that Contractor has not signed it. A Change Order will become effective without Contractor's signature, provided City indicates same thereon (by indicating it as a "unilateral change order").
- C. All changes in any plans and specifications approved by any authority with jurisdiction may also require addenda or change orders approved by that authority.
- D. Where City requests, a performance bond rider covering the changed Work must be executed and delivered to City before proceeding with the changed Work or shortly in time thereafter.

### 10.03 Procedures And Pricing Of Changed Work

- A. Procedures for changed work and pricing of changed work, claims and all forms of extra compensation, are set forth in Section 01 2600 (Modification Procedures).

## ARTICLE 11 – TIME ALLOWANCES

### 11.01 Time Allowances

- A. Time is of the essence. Contract Time may only be changed by Change Order, and all time limits stated in the Contract Documents are to mean that time is of the essence.

### 11.02 Excusable Delay And Inexcusable Delay Defined.

- A. Excusable Delay. Subject to the provisions on Notice of Delay below, Contract Time may be adjusted in an amount equal to the time lost due to:
  1. Changes in the Work ordered by City ("**Changes**");
  2. Acts or neglect by City, Architect, any City Representative, utility owners or other contractors performing other work, not permitted or provided for in the Contract Documents, provided that Contractor has performed its responsibilities under the Contract Documents (including but not limited to pre-bid investigations) ("**Acts or Neglect**"); or
  3. Fires, floods, epidemics, abnormal weather conditions beyond the parameters otherwise set forth in this Article, earthquakes, civil or labor disturbances, or acts of God (together, "force majeure events"), provided damages resulting therefrom are not the result of Contractor's failure to protect the Work as required by Contract Documents ("**Force Majeure**").
- B. Inexcusable Delay. Contract Time shall not be extended for any period of time where Contractor (and/or any Subcontractor) is delayed or prevented from completing any part of the Work due to a

cause that is within Contractor's risk or responsibility under the Contract Documents. Delays attributable to or within the control of a Subcontractor, or its subcontractors, or supplier, are deemed delays within the control of Contractor.

- C. Float. Float shall be treated as a Project resource. Contractor shall not be entitled to a time extension for impacts that consume float, but do not impact the critical path.

### 11.03 Notice Of Delay

- A. Within seven calendar days of the beginning of any delay (excepting adverse weather delays), Contractor shall notify City in writing, by submitting a notice of delay that shall describe the anticipated delays resulting from the delay event in question. If Contractor requests an extension of time, Contractor shall submit a Time Impact Evaluation (TIE) within ten calendar days of the notice of delay. City will determine all claims and adjustments in the Contract Time. No claim for an adjustment in the Contract Time will be valid and such claim will be waived if not submitted in accordance with the requirements of this subparagraph. In cases of substantial compliance with the seven-day notice requirement here (but not to exceed twenty-one calendar days from the beginning of the delay event), City may in its sole discretion recognize a claim for delay accompanied with the proper TIE, provided Contractor also shows good faith and a manifest lack of prejudice to City from the late notice.

### 11.04 Compensable Time Extensions

- A. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Sum in addition to Contract Time for:
1. Excusable delay caused solely by Changes in the Work ordered by City, as provided above, and/or
  2. Excusable delay caused solely by Acts or Neglect by City or other person, as provided above.

### 11.05 Non-Compensable Time Extensions

- A. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Time only, without adjustment in Contract Sum, for
1. Periods of excusable delay caused solely by weather or Force Majeure events as provided above in this Article, or
  2. Periods of concurrent delay, where delay results from two or more causes, one of which is compensable (resulting from Changes or Acts or Neglect as set forth above in this Article), and the other of which is non-compensable or unexcusable, such as: acts or neglect of Contractor, Subcontractors or others for whom Contractor is responsible; other acts, omissions and conditions which would not entitle Contractor to adjustment in Contract Time; adverse weather; and/or actions of Force Majeure as provided above in this Article.

### 11.06 Adverse Weather

- A. Adverse weather delays may be allowed only if the number of workdays of adverse weather exceeds the parameters listed or referenced immediately below in this subparagraph and Contractor proves that adverse weather actually caused delays to work on the critical path. Contractor shall give written notice of intent to claim an adverse weather day within one Day of the adverse weather day occurring.
- B. Claims for extension of time for rain delay will not be granted unless the number of calendar days work is prevented by rain exceeds 110% of the average number of rain days expected for the period of the Contract Time, based on the records of the National Oceanic & Atmospheric Administration (NOAA) weather station closest to the Project Site, as measured and reported by NOAA. (For example, for California, Oregon and Washington, these figures are contained in the ">=0.10 inch" column at the applicable weather station's "General Climate Summary Table" for "Precipitation" at <http://www.wrcc.dri.edu/Climsum.html>), pro-rated in the individual month Contractor starts and finishes Work. Delays due to adverse weather conditions will not be allowed for weather conditions that fall within these parameters.

- C. In order to qualify as an adverse weather delay with respect to the foregoing parameters, (i.) daily rainfall must exceed .1 inch, and/or (ii.) daily snowfall must exceed 1.0 inch or more, at the NOAA station located closest to the Project site, as measured and reported by NOAA. Notwithstanding these allowances, Contractor shall at all times employ all available mitigation measures to enable Work to continue, Contractor shall take reasonable steps to mitigate potential weather delays, such as dewatering the Site, lime treatment, and covering Work and material that could be affected adversely by weather. Failure to do so shall be cause for City to not grant a time extension due to adverse weather, where Contractor could have avoided or mitigated the potential delay by exercising reasonable care.
- D. Contractor shall include the foregoing precipitation parameters as a monthly activity in its progress schedule. As Work on the critical path is affected by precipitation, Contractor shall notify City and request that the days be moved to the affected activities. Any adverse weather days remaining shall be considered Project float available to either City or Contractor.
- E. Adverse weather delay for precipitation shall be recognized for the actual period of time Contractor proves it was delayed by precipitation exceeding the specified parameters. For example, and not by way of limitation, if precipitation exceeding the specified parameters does not in fact delay Contractor's progress on the critical path, then no time extension shall be recognized; and conversely, if Contractor proves to City's satisfaction that precipitation exceeding the specified parameters causes delay to Contractor for a period longer than the number of precipitation days incurred (e.g., if it rains or snows during grading work), then Contractor shall be entitled to a time extension equal to the actual period of such delay.
- F. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall employ best practices to protect the Work, manage the construction site and rainwater during inclement weather. Persons performing the Work shall examine surfaces to receive their Work and shall report in writing to Contractor, with copy to City representative and the Architect conditions detrimental to the Work. Failure to examine and report discrepancies makes the Contractor responsible, at no increase in Contract Sum, for corrections City may require. Commencement of Work constitutes acceptance of surface.

#### **11.07 Liquidated Damages**

- A. Time is of the essence. Execution of Contract Documents by Contractor shall constitute its acknowledgement that City will actually sustain damages in the form of Contract administration expenses (such as Project management and consultant expenses) in the amount fixed in the Contract Documents for each and every Day during which completion of Work required is delayed beyond expiration of time fixed for completion plus extensions of time allowed pursuant to provisions hereof.
- B. Contractor and City agree that because of the nature of the Project, it would be impractical or extremely difficult to fix the amount of such actual damages incurred by City because of a delay in completion of all or any part of the Work. Contractor and City agree that specified measures of liquidated damages shall be presumed to be the amount of such damages actually sustained by City, and that because of the nature of the Project, it would be impracticable or extremely difficult to fix the actual damages.
- C. Liquidated damages for delay shall cover administrative, overhead, interest on bonds, and general loss of public use damages suffered by City as a result of delay. Liquidated damages shall not cover the cost of completion of the Work, damages resulting from Defective Work, lost revenues or costs of substitute facilities, or damages suffered by others who then seek to recover their damages from City (for example, delay claims of other contractors, subcontractors, tenants, or other third-parties), and defense costs thereof. City may deduct from any money due or to become due to Contractor subsequent to time for completion of entire Work and extensions of time allowed pursuant to provisions hereof, a sum representing then-accrued liquidated damages.

### **ARTICLE 12 – CLAIMS BY CONTRACTOR**

#### **12.01 Obligation to File Claims for Disputed Work**

- A. Should it appear to Contractor that the Work to be performed or any of the matters relative to the

Contract Documents are not satisfactorily detailed or explained therein, or should any questions arise as to the meaning or intent of the Contract Documents, or should any dispute arise regarding the true value of any work performed, work omitted, extra work that the Contractor may be required to perform, time extensions, payment to the Contractor during performance of this Contract, performance of the Contract, and/or compliance with Contract procedures, or should Contractor otherwise seek extra time or compensation FOR ANY REASON WHATSOEVER, then Contractor shall first follow procedures set forth in the Contract (including but not limited to other Articles of this Document 00 7200 and Section 01 2600.) If a dispute remains, then Contractor shall give written notice to City that expressly invokes this Article 12. City shall decide the issue in writing within 15 calendar days; and City's written decision shall be final and conclusive. If Contractor disagrees with City's decision, or if Contractor contends that City failed to provide a decision timely, then Contractor's SOLE AND EXCLUSIVE REMEDY is to promptly file a written claim setting forth Contractor's position as required herein.

#### **12.02 Form And Contents Of Claim**

- A. Contractor's written claim must identify itself as a "Claim" under this Article 12 and must include the following: (1) a narrative of pertinent events; (2) citation to contract provisions; (3) theory of entitlement; (4) complete pricing of all cost impacts; (5) a time impact analysis of all time delays that shows actual time impact on the critical path; (6) documentation supporting items 1 through 5; a verification under penalty of perjury of the claim's accuracy. The Claim shall be submitted to City within thirty (30) calendar days of receiving City's written decision, or the date Contractor contends such decision was due, and shall be priced like a change order according to Section 01 2600, and must be updated monthly as to cost and entitlement if a continuing claim. Routine contract materials, for example, correspondence, RFI, Change Order requests, or payment requests shall not constitute a claim. Contractor shall bear all costs incurred in the preparation and submission of a claim.

#### **12.03 Administration During/After Claim Submission**

- A. City may render a final determination based on the Claim or may in its discretion conduct an administrative hearing on Contractor's claim, in which case Contractor shall appear, participate, answer questions and inquiries, and present any further evidence or analysis requested by City prior to rendering a final determination. Should City take no action on the Claim within 45 calendar days of submission, it shall be deemed denied.
- B. Notwithstanding and pending the resolution of any claim or dispute, Contractor shall diligently prosecute the disputed work to final completion in accordance with City's determination.
- C. After their submission, claims less than \$375,000 shall also be subject to the Local Agency Disputes Act.

#### **12.04 Compliance**

- A. The provisions of this Article 12 constitute a non-judicial claim settlement procedure that, pursuant to Section 930.2 of the California Government Code, shall constitute a condition precedent to submission of a valid Government Code Claim under the California Government Code. Contractor shall bear all costs incurred in the preparation, submission and administration of a claim. Any claims presented in accordance with the Government Code must affirmatively indicate Contractor's prior compliance with the claims procedure herein and the previous dispositions under Paragraph 12.3 above of the claims asserted. Pursuant to Government Code Section 930.2, the one-year period in Government Code section 911.2 shall be reduced to 150 calendar days from either accrual of the cause of action, substantial completion or termination of the contract, whichever occurs first; in all other respects, the Government Code shall apply unchanged.
- B. Failure to submit and administer claims as required in Article 12 shall waive Contractor's right to claim on any specific issues not included in a timely submitted claim. Claim(s) or issue(s) not raised in a timely protest and timely claim submitted under this Article 12 may not be asserted in any subsequent litigation, Government Code Claim, or legal action.
- C. City shall not be deemed to waive any provision under this Article 12, if at City's sole discretion, a

claim is administered in a manner not in accord with this Article 12. Waivers or modifications of this Article 12 may only be made a signed change order approved as to form by legal counsel for both City and Contractor; oral or implied modifications shall be ineffective.

## **ARTICLE 13 – UNDERGROUND CONDITIONS**

### **13.01 Contractor To Locate Underground Facilities.**

- A. During construction, Contractor shall comply with Government Code Sections 4216 to 4216.9, and in particular Section 4216.2 which provides, in part: “Except in an emergency, every person planning to conduct any excavation shall contact the appropriate regional notification center at least two working days, but no more than 14 calendar days, prior to commencing that excavation, if the excavation will be conducted in an area which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the excavator, and, if practical, the excavator shall delineate with white paint or other suitable markings the area to be excavated. The regional notification center shall provide an inquiry identification number to the person who contacts the center and shall notify any member, if known, who has a subsurface installation in the area of the proposed excavation.”
- B. Contractor shall contact USA, and schedule the Work to allow ample time for the center to notify its members and, if necessary, for any member to field locate and mark its facilities. Contractor is charged with knowledge of all subsurface conditions reflected in USA records. Prior to commencing excavation or trenching work, Contractor shall provide City with copies of all USA records secured by Contractor. Contractor shall advise City of any conflict between information provided in Document 00 3132 (Geotechnical Data and Existing Conditions), the Drawings and that provided by USA records. Contractor’s excavation shall be subject to and comply with the Contract Documents.
- C. Contractor shall also investigate the existence of existing service laterals, appurtenances or other types of utilities, indicated by the presence of an underground transmission main or other visible facilities, such as buildings, new asphalt, meters and junction boxes, on or adjacent to the Site, even if not shown or indicated in Document 00 3132 (Geotechnical Data and Existing Conditions), the Drawings or that provided by USA records. Contractor shall immediately secure all such available information and notify City and the utility owner, in writing, of its discovery.

### **13.02 Contractor To Protect Underground Facilities.**

- A. At all times during construction, all operating Underground Facilities shall remain in operation, unless the Contract Documents expressly indicate otherwise. Contractor shall maintain such Underground Facilities in service where appropriate; shall repair any damage to them caused by the Work; and shall incorporate them into the Work, including reasonable adjustments to the design location (including minor relocations) of the existing or new installations. Contractor shall take immediate action to restore any in service installations damaged by Contractor’s operations.
- B. Prior to performing Work at the Site, Contractor shall lay out the locations of Underground Facilities that are to remain in service and other significant known underground installations indicated by the Underground Facilities Data. Contractor shall further locate, by carefully excavating with small equipment, potholing and principally by hand, all such utilities or installations that are to remain and that are subject to damage. If additional utilities whose locations are unknown are discovered, Contractor shall immediately report to City for disposition of the same. Additional compensation or extension of time on account of utilities not shown or otherwise brought to Contractor’s attention, including reasonable action taken to protect or repair damage, shall be determined as provided in this Document 00 7200.
- C. If during construction, an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated in the materials supplied by City for bidding or in information on file at USA or otherwise reasonably available to Contractor, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby (and in no event later than seven calendar days), and prior to performing any Work in connection therewith (except in an emergency), identify the owner of such Underground Facility and give written notice to that owner and to City. During such time, Contractor shall be responsible for the

safety and protection of such Underground Facility.

- D. The cost of all of the following will be included in the Contract Sum and Contractor shall have full responsibility for (a) reviewing and checking all available information and data including, but not limited to, information made available for bidding and information on file at USA; (b) locating all Underground Facilities shown or indicated in the Contract Documents, available information, or indicated by visual observation including, but not limited to, and by way of example only, engaging qualified locating services and all necessary backhoeing and potholing; (c) coordination of the Work with the owners of such Underground Facilities during construction; and (d) the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
- E. Consistent with California Government Code §4215, as between City and Contractor, City will be responsible for the timely removal, relocation, or protection of existing main or trunk line utility facilities located on the Site only if such utilities are not identified in the Contract Documents or information made available for bidding. City will compensate for the cost of locating and repairing damage not due to Contractor's failure to exercise reasonable care, removing and relocating such main or trunk line utility facilities not indicated in the Contract Documents or information made available for bidding with reasonable accuracy, and equipment on the Project necessarily idled during such Work. Contractor shall not be assessed liquidated damages for delay in completion of the Project, when such delay was caused by the failure of City or the utility to provide for removal or relocation of such utility facilities.

### **13.03 Concealed Or Unknown Conditions**

- A. If either of the following conditions is encountered at Site when digging trenches or other excavations that extend deeper than four feet below the surface, Contractor shall give a written Notice of Differing Site Conditions to City promptly before conditions are disturbed, except in an emergency as set forth in this Document 00 7200, and in no event later than seven calendar days after first observance of:
  - 1. Subsurface or Latent physical conditions which differ materially from those indicated in the Contract Documents; or
  - 2. Unknown physical conditions of an unusual nature or which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.
- B. In response to Contractor's Notice of Differing Site Conditions under this Paragraph, City will investigate the identified conditions, and if they differ materially and cause increase or decrease in Contractor's cost of, or time required for, performance of any part of the Work, City will negotiate the appropriate change order following the procedures set forth in the Contract Documents. If City determines that physical conditions at the Site are not Latent or are not materially different from those indicated in Contract Documents or that no change in terms of the Contract Documents is justified, City will so notify Contractor in writing, stating reasons (with Contractor retaining its rights under Article 12 of this Document 00 7200.)
- C. Contractor shall not be entitled to any adjustment in the Contract Sum or Contract Time regarding claimed Latent or materially different Site conditions (whether above or below grade) if Contractor knew or should have known of the existence of such conditions at the time Contractor submitted its Bid, failed to give proper notice, or relied upon information, conclusions, opinions or deductions of the kind that the Contract Documents preclude reliance upon.
- D. Regarding Underground Facilities, Contractor shall be allowed an increase in the Contract Sum or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that is owned and was built by City only where the Underground Facility:
  - 1. Was not shown or indicated in the Contract Documents or in the information supplied for bidding purposes or in information on file at USA; and
  - 2. Contractor did not know of it; and
  - 3. Contractor could not reasonably have been expected to be aware of it or to have anticipated it from the information available. (For example, if surface conditions such as



pavement repairs, valve covers, or other markings, indicate the presence of an Underground Facility, then an increase in the Contract Sum or an extension of the Contract Time will not be due, even if the Underground Facility was not indicated in the Contract Documents, in the information supplied to Contractor for bidding purposes, in information on file at USA, or otherwise reasonably available to Contractor.)

- E. Contractor shall bear the risk that Underground Facilities not owned or built by City may differ in nature or locations shown in information made available by City for bidding purposes, in information on file at USA, or otherwise reasonably available to Contractor. Underground Facilities are inherent in construction involving digging of trenches or other excavations on City's Project, and Contractor is to apply its skill and industry to verify the information available.
- F. Contractor's compensation for claimed Latent or materially different Site conditions shall be limited to the actual, reasonable, incremental increase in cost of that portion of the Work, resulting from the claimed Latent or materially different Site conditions. Such calculation shall take into account the estimated value of that portion of the Work and the actual value of that portion of the Work, using for guidance Contractor's or its subcontractor's bid amount and actual amounts incurred for that portion of the Work and the reasonable expectation (if any) of differing or difficult site conditions in the Work area based on the available records and locale of the Work. For example, if Contractor excavates in an area unexpected, then such costs would be recoverable entirely; while if Contractor extends an existing excavation, then such costs would be recoverable if the resulting excavation costs in that work area exceeded the reasonable expectations therefore.

#### **13.04 Notice Of Hazardous Waste Or Materials Conditions**

- A. Contractor shall give a written Notice of Hazardous Materials Condition to City promptly, before any of the following conditions are disturbed (except in an emergency as set forth in this Document 00 7200), and in no event later than 24 hours after first observance of any:
  - 1. Material that Contractor believes may be hazardous waste or hazardous material, as defined in Section 25117 of the Health and Safety Code (including, without limitation, Asbestos, lead, PCBs, petroleum and related hydrocarbons, and radioactive material) that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law ("hazardous material"); or
  - 2. Other material that may present an imminent substantial danger to persons or property exposed thereto in connection with Work at the Site ("other materials").
- B. Except as otherwise provided in the Contract Documents or as provided by applicable law, Contractor shall not be required to give any notice for the disturbance or observation of any such hazardous materials or other materials where such matter is disturbed or observed as part of the scope of Work under the Contract Documents (such as hazardous waste or hazardous material investigation, remediation or disposal activities which are identified as the subject of Work under the Contract Documents), where Contractor complies with all requirements in the Contract Documents and applicable law respecting such materials.
- C. Contractor's Notice of Hazardous Materials Condition shall indicate whether the hazardous materials or other materials were shown or indicated in the Contract Documents to be within the scope of Work, and whether the hazardous materials or other materials were brought to the Site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible.
- D. Contractor shall not be entitled to any adjustment in the Contract Sum or Contract Time regarding claimed hazardous waste or materials if:
  - 1. Contractor knew of the existence of such hazardous materials or other materials at the time Contractor submitted its Bid; or
  - 2. Contractor should have known of the existence of such hazardous material or other materials as a result of its having the responsibility to obtain additional or supplementary examinations, investigation, explorations, tests, studies, and data concerning the conditions at or contiguous to the Site prior to submitting its Bid; or
  - 1. Contractor failed to give the written notice within the required timeframe set forth below.
- E. If City determines that conditions involve hazardous materials or other materials and that a

change in Contract Document terms is justified, City will issue either a Request for Proposal or Construction Change Directive under the procedures described in the Contract Documents. If City determines that conditions do not involve hazardous materials or other materials or that no change in Contract Document terms is justified, City will notify Contractor in writing, stating the reasons for its determination.

- F. In addition to the parties' other rights under this Document 00 7200, if Contractor does not agree to resume Work based on a reasonable belief that it is unsafe, or does not agree to resume Work under special conditions, City may order the disputed portion of Work deleted from the Work, or performed by others, or City may invoke its right to terminate Contractor's right to proceed under the Contract Documents in whole or in part, for convenience or for cause as the facts may warrant.
- G. If Contractor does not agree with any City determination of any adjustment in the Contract Sum or Contract Time under this Article, Contractor may make a claim as provided in Article 12 of this Document 00 7200.

## **ARTICLE 14 – LEGAL AND MISCELLANEOUS**

### **14.01 Laws And Regulations**

- A. Contractor shall keep fully informed of and shall comply with all laws, ordinances, regulations and orders of any properly constituted authority affecting the Contract Documents, Work and persons connected with Work, and shall protect and indemnify City and its officers, employees, consultants and agents against any claim or liability, including attorney's fees, arising from or based on violation of law, ordinance, regulation or order, whether by Contractor or by Subcontractors, employees or agents. Authorized persons may at any time enter upon any part of Work to ascertain compliance of all applicable laws, ordinances, regulations and orders.

### **14.02 Permits And Taxes**

- A. Contractor shall procure all permits and licenses applicable to the Work (including environmental matters to the extent applicable); pay all charges and fees, including fees for street opening permits; comply with, implement and acknowledge effectiveness of all permits; initiate and cooperate in securing all required notifications or approvals therefore; and give all notices necessary and incident to due and lawful prosecution of Work, unless otherwise provided herein. City will pay applicable building permits, sanitation and water fees for the completed construction, except as otherwise provided in the Contract Documents. Contractor shall pay all sales and/or use taxes levied on materials, supplies, or equipment purchased and used on or incorporated into Work, and all other taxes properly assessed against equipment or other property used in connection with Work, without any increase in the Contract Sum. Contractor shall make necessary arrangements with proper authorities having jurisdiction over roads, streets, pipelines, navigable waterways, railroads, and other works in advance of operations, even where City may have already obtained permits for the Work.

### **14.03 Communications And Information Distribution**

- A. All communications recognized under the Contract Documents shall be in writing, in the form of a serialized document, by type of communication. For example, RFI's shall be serialized beginning with RFI No. 1; payment applications shall be serialized beginning with Payment Application No. 1, submittals shall be serialized per specification section and transmitted with transmittal sheets beginning with Transmittal No. 1; and correspondence shall be serialized beginning with letter No. 1. Contractor may propose other record management and identification systems or protocols, intended to facilitate orderly transmittal of project information, storage and retrieval of such information, which City will review consistent with these stated objectives, and accept or reject in its sole discretion.
- B. Documents Requiring Signatures. All documents requiring signatures for approval prior to implementing action, as stipulated in other portions of Contract Documents, shall require a manually signed, serialized letter delivered to the other party at its address for notice otherwise specified in the Contract Documents, either personally or by mail.

- C. Electronic data transfer of such correspondence will serve to expedite preliminary concurrence of information, only. Receipt of "hard copy" signature on forms is required prior to implementing action or work as the conditions may require. For example, change orders and authorizations for extra cost, require signatures. A party may acknowledge receipt of PDF copies of required correspondence by e-mail, but in the absence of such acknowledgment, mail or personal delivery is required.
- D. All emails shall be copied to City's and Contractor's Project Representative. City reserves the right to preclude e-mail communication, in whole or in part, as Project needs may require. Communication between City and Contractor shall not be via Twitter, Facebook, or other types of instant text message systems. Any such communications shall be inadmissible for any purpose related to this Contract.

#### **14.04 Suspension Of Work**

- A. City may, without cause, order Contractor in writing to suspend, delay or interrupt Work in whole or in part for such period of time as City may determine. An adjustment shall be made for increases in cost of performance of Work of the Contract Documents caused by any such suspension, delay or interruption, calculated using the measures set forth in Section 01 2600 (Modification Procedures). No adjustment shall be made to extent that performance is, was or would have been so suspended, delayed or interrupted by another cause for which Contractor is responsible.

#### **14.05 Termination Of Contract For Cause**

- A. The Contractor shall be in default of the Contract Documents and City may terminate the Contractor's right to proceed under the Contract Documents, for cause, in whole or in part, should the Contractor commit a material breach of the Contract Documents and not cure such breach within ten (10) calendar days of the date of notice from City to the Contractor demanding such cure; or, if such breach is curable but not curable within such ten (10) day period, within such period of time as is reasonably necessary to accomplish such cure. (In order for the Contractor to avail itself of a time period in excess of 10 calendar days, the Contractor must provide City within the ten (10) day period with a written plan acceptable to City that demonstrates actual resources, personnel and a schedule to promptly to cure said breach, and then diligently commence and continue such cure according to the written plan).
- B. In the event of termination by City for cause as provided herein, the Contractor shall deliver to City possession of the Work in its then condition, including but not limited to, all designs, engineering, Project records, cost data of all types, plans and specifications and contracts with vendors and subcontractors, all other documentation associated with the Project, and all construction supplies and aids dedicated solely to performing the Work which, in the normal course of construction, would be consumed or only have salvage value at the end of the construction period. The Contractor shall remain fully liable for the failure of any Work completed and materials and equipment provided through the date of such termination to comply with the provisions of the Contract Documents. The provisions of this Section shall not be interpreted to diminish any right which City may have to claim and recover damages for any breach of the Contract Documents or otherwise, but rather, the Contractor shall compensate City for all loss, cost, damage, expense, and/or liability suffered by City as a result of such termination and/or failure to comply with the Contract Documents.
- C. In the event a termination for cause is later determined to have been made wrongfully or without cause, then the termination shall be treated as a termination for convenience, and the Contractor shall have no greater rights than it would have had following a termination for convenience. Any Contractor claim arising out of a termination for cause shall be made in accord with Article 12 herein. No other loss, cost, damage, expense or liability may be claimed, requested or recovered by the Contractor.

#### **14.06 Termination Of Contract For Convenience**

- A. City may terminate performance of the Work under the Contract Documents in accordance with this clause in whole, or from time to time in part, whenever City shall determine that termination is

in City's best interest. Termination shall be effected by City delivering to the Contractor notice of termination specifying the extent to which performance of the Work under the Contract Documents is terminated, and the effective date of the termination.

- B. Contractor shall comply strictly with City's direction regarding the effective date of the termination, the extent of the termination, and shall stop work on the date and to the extent specified.
- C. Contractor shall be entitled to a total payment on account of the Contract work so terminated measured by (i.) the actual cost to Contractor of Work actually performed, up to the date of the termination, with profit and overhead limited to twelve percent (12%) of actual cost of work performed, up to but not exceeding the actual contract value of the work completed as measured by the Schedule of Values and Progress Schedule, (ii.) offset by payments made and other contract credits. In connection with any such calculation, however, City shall retain all rights under the Contract Documents, including but not limited to claims, indemnities, or setoffs.
- D. Under no circumstances may Contractor recover legal costs of any nature, nor may Contractor recover costs incurred after the date of the termination.

#### **14.07 Contingent Assignment Of Subcontracts**

- A. Contractor hereby assigns to City each Subcontract for a portion of the Work, provided that:
  - 1. The assignment is effective only after City's termination of Contractor's right to proceed under the Contract Documents (or portion thereof relating to that Subcontract) as set forth herein.
  - 2. The assignment is effective only for the Subcontracts which City expressly accepts by notifying the Subcontractor in writing;
  - 3. The assignment is subject to the prior rights, if any, of the Surety, obligated by Document 00 6113.13 (Construction Performance Bond) provided under the Contract Documents, where the Surety exercises its rights to complete the Contract;
  - 4. After the effectiveness of an assignment, Contractor shall, at its sole cost and expense (except as otherwise provided in this Document 00 7200), sign all instruments and take all actions reasonably requested by City to evidence and confirm the effectiveness of the assignment in City; and
  - 5. Nothing in this Paragraph shall modify or limit any of Contractor's obligations to City arising from acts or omissions occurring before the effectiveness of any Subcontract assignment, including but not limited to all defense, indemnity and hold-harmless obligations arising from or related to the assigned Subcontract.

#### **14.08 Remedies And Contract Integration**

- A. Subject to Contract Documents provisions regarding Contractor claims, claim review, and claim resolution, and subject to the limitations therein, the exclusive jurisdiction and venue for resolving all claims, counter claims, disputes and other matters in question between City and Contractor arising out of or relating to Contract Documents, any breach thereof or the Project shall be the applicable court of competent jurisdiction located in the State and County where the Project is located. All City remedies provided in the Contract Documents shall be taken and construed as cumulative and not exclusive; that is, in addition to each and every other remedy herein provided; and in all instances City shall have any and all other equitable and legal rights and remedies which it would have according to law.
- B. The Contract Documents, any Contract Modifications and Change Orders, shall represent the entire and integrated agreement between City and Contractor regarding the subject matters hereof and thereof and shall constitute the exclusive statement of the terms of the parties' agreement. The Contract Documents, and any Contract Modifications and Change Orders, shall supersede any and all prior negotiations, representations or agreements, written or oral, express or implied, that relate in any way to the subject matter of the Contract Documents or written Modifications. City and Contractor represent and agree that, except as otherwise expressly provided in the Contract Documents, they are entering into the Contract Documents and any subsequent written Modification in sole reliance upon the information set forth or referenced in the Contract Documents or Contract Modifications; the parties are not and will not rely on any other

information, which shall be inadmissible in any proceeding to enforce these documents.

- C. Either party's waiver of any breach or failure to enforce any of the terms, covenants, conditions or other provisions of the Contract Documents at any time shall not in any way affect, limit, modify or waive that party's right thereafter to enforce or compel strict compliance with every term, covenant, condition or other provision hereof, any course of dealing or custom of the trade or oral representations notwithstanding.
- D. Neither acceptance of the whole or any part of Work by City nor any verbal statements on behalf of City or its authorized agents or representatives shall operate as a waiver or modification of any provision of the Contract Documents, or of any power reserved to City herein nor any right to damages provided in the Contract Documents.

#### **14.09 Interpretation.**

- A. Should any part, term or provision of this Agreement or any of the Contract Documents, or any document required herein or therein to be executed or delivered, be declared invalid, void or unenforceable, all remaining parts, terms and provisions shall remain in full force and effect and shall in no way be invalidated, impaired or affected thereby. If the provisions of any law causing such invalidity, illegality or unenforceability may be waived, they are hereby waived to the end that this Agreement and the Contract Documents may be deemed valid and binding agreements, enforceable in accordance with their terms to the greatest extent permitted by applicable law. In the event any provision not otherwise included in the Contract Documents is required to be included by any applicable law, that provision is deemed included herein by this reference (or, if such provision is required to be included in any particular portion of the Contract Documents, that provision is deemed included in that portion).
- B. Contract Documents shall not be construed to create a contractual relationship of any kind between (1) Project Manager or any City's representative and Contractor; (2) City and/or its Representatives and a Subcontractor, sub-Subcontractor, or supplier of any Project labor, materials, or equipment; or (3) between any persons or entities other than City and Contractor.

#### **14.10 Patents**

- A. Fees or claims for any patented invention, article or arrangement that may be used upon or in any manner connected with performance of the Work or any part thereof shall be included in the Bid price for doing the Work. Contractor shall defend, indemnify and hold harmless City and each of its officers, employees, consultants and agents, including, but not limited to, the Board and each City's Representative, from all damages, claims for damages, costs or expenses in law or equity, including attorney's fees, arising from or relating to any claim that any article supplied or to be supplied under the Contract Documents infringes on the patent rights, copyright, trade name, trademark, service mark, trade secret or other intellectual property right of any person or persons or that the person or entity supplying the article does not have a lawful right to sell the same. Such costs or expenses for which Contractor agrees to indemnify and hold harmless the above indemnities include but are not limited to any and all license fees, whether such fees are agreed by any indemnitee or ordered by a court or administrative body of any competent jurisdiction.

#### **14.11 Substitution For Patented And Specified Articles**

- A. Except as noted specifically in the instructions to Bidders or in Contract Documents, whenever in Specifications, material or process is designated by patent or proprietary name or by name of manufacturer, such designation shall be deemed to be used for purpose of facilitating description of material and process desired, and shall be deemed to be followed by the words "or Approved Equal" and Contractor may offer any substitute material or process that Contractor considers "equal" in every respect to that so designated and if material or process offered by Contractor is, in opinion of City, Equal in every respect to that so designated, its use will be approved. However, Contractor may utilize this right only by timely submitting Document 00 6325 (Substitution Request Form) as provided in Document 00 2113 (Instructions to Bidders). A substitution will be approved only if it is a true "or equal" item in every aspect of its design and quality, including but not limited to its dimensions, weights, service requirements, durability, functioning, impact on contiguous construction elements, overall schedule and design.

**14.12 Interest Of Public Officers**

- A. No representative, officer, or employee of City no member of the governing body of the locality in which the Project is situated, no member of the locality in which City was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the Project, during the tenure of the official or for one year thereafter, shall, as principal, agent, attorney or otherwise, be directly or indirectly interested, in the Contract Documents or the proceeds thereof.

**14.13 Limit Of Liability**

- A. CITY, AND EACH OF ITS OFFICERS, BOARD MEMBERS, EMPLOYEES, CONSULTANTS AND AGENTS INCLUDING, BUT NOT LIMITED TO, PROJECT MANAGER AND EACH OTHER CITY REPRESENTATIVE, SHALL HAVE NO LIABILITY TO CONTRACTOR FOR SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, EXCEPT TO THE LIMITED EXTENT THAT THESE CONTRACT DOCUMENTS OR APPLICABLE PUBLIC CONTRACTING STATUTES MAY SPECIFY THEIR RECOVERY.

**ARTICLE 15 – WORKING CONDITIONS AND PREVAILING WAGES****15.01 Use Of Site/Sanitary Rules**

- A. All portions of the Work shall be maintained at all times in neat, clean and sanitary condition. Contractor shall furnish toilets for use of Contractor's and Subcontractors' employees on the Site where needed, and their use shall be strictly enforced. All toilets shall be properly secluded from public observation, and shall be located, constructed and maintained subject to City's approval.
- B. Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Site and land areas identified in and permitted by Contract Documents and other land and areas permitted by applicable laws and regulations, rights of way, permits and easements or as designated by City, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, any improvement located thereon, or to City or occupant thereof resulting from the performance of Work.
- C. During the progress of the Work, Contractor shall keep the Site and the Project free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, Contractor shall clean the site, remove all waste materials, rubbish and debris from and about the Site as well as all tools, appliances, construction equipment and machinery and surplus materials. Contractor shall leave the premises clean and ready for occupancy by City at Substantial Completion of Work. Contractor shall restore to original condition all property not designated for alteration by Contract Documents.
- D. Contractor shall not load nor permit any part of any structure or pavement to be loaded in any manner that will endanger the structure or pavement, nor shall Contractor subject any part of Work or adjacent property to stresses or pressures that will endanger it. Contractor shall conduct all necessary existing conditions investigation regarding structural, mechanical, electrical or any other system existing, shall perform Work consistent with such existing conditions, and shall have full responsibility for insufficiencies or damage resulting from insufficiencies of existing systems, equipment or structures to accommodate performing the Work.

**15.02 Protection Of Work, Persons, And Property**

- A. Contractor shall be responsible for initiating, maintaining and supervising all safety and site security precautions and programs in connection with Work, and shall develop and implement a site security and safety plan throughout construction. Contractor shall comply with all safety requirements specified in any safety program established by City, or required by state, federal or local laws and ordinances. Contractor shall be responsible for all theft or damage to Work, property or structures, and all injuries to persons, either on the Site or constituting the Work (e.g., materials in transit), arising from the performance of Work of the Contract Documents from a cause.

- B. Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property.
- C. Contractor shall remedy all damage, injury or loss to any property referred to above in this Article, caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, supplier, or any other person or organization directly or indirectly employed by any of them to perform or furnish any Work or anyone for whose acts any of them may be liable. Contractor's duties and responsibility for safety and for protection of Work shall continue until such time as all the Work is completed and Final Acceptance of the Work. City and its agents do not assume any responsibility for collecting any indemnity from any person or persons causing damage to Contractor's Work.
- D. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.
- E. City may, at its option, retain such moneys due under the Contract Documents as City deems necessary until any and all suits or claims against Contractor for injury to persons or property shall be settled and City receives satisfactory evidence to that effect.
- F. Work within the right-of-way lines of the city and/or City and/or State shall be done in accordance with the standards and specifications of the controlling agency. Permit for such work shall be obtained and paid for by the Contractor before executing the work within such right-of-ways.

#### **15.03 Responsibility For Safety And Health**

- A. Contractor shall ensure that its and each tier of Subcontractors' employees, agents and invitees comply with applicable health and safety laws while at the Site. These laws include the Occupational Safety and Health Act of 1970 and rules and regulations issued pursuant thereto, and City's safety regulations as amended from time to time. Contractor shall comply with all City directions regarding protective clothing and gear.
- B. Contractor shall be fully responsible for the safety of its and its Subcontractors' employees, agents and invitees on the Site. Contractor shall notify City, in writing, of the existence of hazardous conditions, property or equipment at the Site that are not under Contractor's control. Contractor shall be responsible for taking all the necessary precautions against injury to persons or damage to the property of Contractor, Subcontractors or persons from recognized hazards until the responsible party corrects the hazard.
- C. Contractor shall confine all persons acting on its or its Subcontractors' behalf to that portion of the Site where Work under the Contract Documents is to be performed, City-designated routes for ingress and egress thereto, and any other City-designated area. Except those routes for ingress and egress over which Contractor has no right of control, within such areas, Contractor shall provide safe means of access to all places at which persons may at any time have occasion to be present.

#### **15.04 Emergencies**

- A. In emergencies affecting the safety or protection of persons or Work or property at the Site or adjacent thereto, Contractor, without special instruction or authorization from City, is obligated to act to prevent threat and damage, injury or loss, until directed otherwise by City. Contractor shall give City prompt written notice if Contractor believes that any significant changes in Work or variations from Contract Documents have been caused thereby. If City determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Change Order or Construction Change Directive will be issued to document the consequences of such action.

#### **15.05 Use Of Roadways And Walkways**

- A. Contractor shall not unnecessarily interfere with use of any roadway, walkway or other facility for

vehicular or pedestrian traffic. Before beginning any interference and only with City's prior concurrence, Contractor may provide detour or temporary bridge for traffic to pass around or over the interference, which Contractor shall maintain in satisfactory condition as long as interference continues. Unless otherwise provided in the Contract Documents, Contractor shall bear the cost of these temporary facilities.

#### **15.06 Nondiscrimination**

- A. No person or entity shall discriminate in the employment of persons upon public works because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status, sexual preference, or gender of such persons, except as provided in Section 12940 of the California Government Code. Every contractor for public works violating the provisions of Section 1735 of the California Labor Code is subject to all the penalties imposed for a violation of Chapter 1, Part 7, Division 2 of the California Labor Code.

#### **15.07 Prevailing Wages And Working Hours**

- A. Contractor shall pay to persons performing labor in and about Work provided for in the Contract Documents an amount equal to or more than the general prevailing rate of per diem wages for (1) work of a similar character in the locality in which the Work is performed and (2) legal holiday and overtime work in said locality. The per diem wages shall be an amount equal to or more than the stipulated rates contained in a schedule that has been ascertained and determined by the Director of the State Department of Industrial Relations and City to be the general prevailing rate of per diem wages for each craft or type of workman or mechanic needed to execute this Contract. Contractor shall also cause a copy of this determination of the prevailing rate of per diem wages to be posted at each Site.
- B. Contractor shall forfeit, as a penalty to City, Fifty Dollars (\$50.00) for each laborer, workman, or mechanic employed in performing labor in and about the Work provided for in the Contract Documents for each Day, or portion thereof, that such laborer, workman or mechanic is paid less than the said stipulated rates for any Work done under the Contract Documents by him or her or by any Subcontractor under him or her, in violation of Articles 1 and 2 of Chapter 1 of Part 7 of Division II of the California Labor Code. The sums and amounts which shall be forfeited pursuant to this Paragraph and the terms of the California Labor Code shall be withheld and retained from payments due to Contractor under the Contract Documents, pursuant to this Document 00 7200 and the California Labor Code, but no sum shall be so withheld, retained or forfeited except from the final payment without a full investigation by either the State Department of Industrial Relations or by City. The Labor Commissioner pursuant to California Labor Code §1775 shall determine the final amount of forfeiture.
- C. Contractor shall insert in every subcontract or other arrangement which Contractor may make for performance of Work or labor on Work provided for in the Contract, provision that Subcontractor shall pay persons performing labor or rendering service under subcontract or other arrangement not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the Work is performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work fixed in the California Labor Code.
- D. Contractor stipulates that it shall comply with all applicable wage and hour laws, including without limitation, California Labor Code §§ 1776 and 1810-1815. Failure to so comply shall constitute a default under this Contract.
- E. Contractor and its Subcontractors shall be responsible for compliance with Labor Code §§ 1810-1815.
  - 1. Eight hours of labor performed in execution of the Contract constitutes a legal day's work. The time of service of any workman employed on the Project is limited and restricted to 8 hours during any one calendar day, and 40 hours during any one calendar week.
  - 2. Contractor and its Subcontractors shall keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by him or her in connection with the Project. The record shall be kept open at all reasonable hours to the inspection City and to the Division of Labor Standards Enforcement.



3. Contractor or its Subcontractors shall, as a penalty to City, forfeit twenty-five dollars (\$25) for each worker employed in the execution of the Contract Documents by the respective Contractor or Subcontractor for each calendar day during which the worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of Labor Code §§ 1810-1815.
  4. Work performed on the Project by employees of Contractor or its Subcontractors in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon compensation for all hours worked in excess of 8 hours per day at not less than 1 1/2 times the basic rate of pay.
- F. Contractor and its Subcontractors shall be responsible for compliance with Labor Code Section 1776.
1. Contractor and Subcontractors must keep accurate payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the Work of the Contract Documents. Each payroll record shall contain or be verified by a written declaration as required by Labor Code Section 1776.
  2. The payroll records enumerated above must be certified and shall be available for inspection at all reasonable hours at the principal office of the Contractor as required by Labor Code Section 1776.
    - a. Contractor shall inform City of the location of records enumerated above, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.
    - b. Contractor or Subcontractor has 10 calendar days in which to comply subsequent to receipt of a written notice requesting the records enumerated above. In the event that the Contractor or Subcontractor fails to comply with the ten-day period, he or she shall, as a penalty to City on whose behalf the contract is made or awarded, forfeit \$25.00 for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. Contractor is not subject to a penalty assessment pursuant to this Paragraph due to the failure of a Subcontractor to comply with this Paragraph.
  3. Contractor shall also deliver certified payrolls to City with each Application for Payment as set forth above in this Document 00 7200 (General Conditions).

#### **15.08 Environmental Controls**

- A. Contractor shall comply with all rules, regulations, ordinances, and statutes that apply to any Work performed under the Contract Documents including, without limitation, any toxic, water, stormwater management and soil pollution controls and air pollution controls specified in California Government Code §11017. Contractor shall be responsible for insuring that Contractor's Employees, Subcontractors, and the public are protected from exposure to airborne hazards or contaminated water, soil, or other toxic materials used during or generated by activities on the Site or associated with the Project.

#### **15.09 Shoring Safety Plan**

- A. Any conflict between this Paragraph and Division 2 of the Specifications shall be resolved in favor of the most stringent requirement.
- B. At least five calendar days in advance of any excavation five feet or more in depth, Contractor shall submit to City a detailed plan showing the shoring, bracing and sloping design (including calculations) and other provisions to be made for worker protection from the hazard of caving ground during the excavation, as required by California Labor Code §6705. A civil or structural engineer registered in California shall prepare and sign any plan that varies from the shoring system standards established by the State Construction Safety Orders.

- C. During the course of Work, Contractor shall be responsible for determining where sloping, shoring, and/or bracing is necessary and the adequacy of the design, installation, and maintenance of all shoring and bracing for all excavation, including any excavation less than five feet in depth. Contractor will be solely responsible for any damage or injuries that may result from excavating or trenching. City's acceptance of any drawings showing the shoring or bracing design or Work schedule shall not relieve Contractor of its responsibilities under this Paragraph.
- D. Appoint a qualified supervisory employee who shall be responsible to determine the sloping or shoring system to be used depending on local soil type, water table, stratification, depth, etc.

## **ARTICLE 16 – CONTRACTING POLICIES**

### **16.01 First Source Hiring Requirement**

- A. Contractor, and any subcontractors, shall utilize the City's First Source Construction Program under the terms set forth in the First Source specifications. (Appendix 00812-C)
  - 1. Under the First Source program, Contractor must employ, to the extent possible, a work force where no less than twenty-five percent of the work hours are performed by Berkeley residents, and fifty percent of all new hires are Berkeley residents, on a craft-by-craft basis.
  - 2. To achieve the goals, Contractors may either:
    - a. Utilize the City's First Source referral service, or
    - b. Demonstrate a good faith effort to achieve the goals

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**DOCUMENT 00 7201**

**SUPPLEMENTAL GENERAL CONDITIONS**

[OPTIONAL]

**END OF SECTION**

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## DOCUMENT 00 7316

## SUPPLEMENTARY CONDITIONS – INSURANCE AND INDEMNIFICATION

## ARTICLE 1 – INSURANCE

- 1.01 At or before the date specified in Document 00 2113 (Instructions to Bidders), Contractor shall furnish to City of Berkeley (“City”) satisfactory proof that Contractor has taken out for the entire period covered by the Contract the following classes of insurance in the form and with limits and deductibles specified below, unless otherwise specified in Contract Documents:**
- A. Comprehensive General Liability Insurance covering claims for personal injury, bodily injury and property damage arising out of the Work and in a form providing coverage not less than that of a Standard Commercial General Liability Insurance policy (“Occurrence Form”). Such insurance shall provide for all operations and include independent contractors, products liability, completed operations for one year after Final Completion and acceptance of the final payment for the Work, contractual liability, and coverage for explosion, collapse, and underground hazards. The limits of such insurance shall not be coverage of less than **\$2,000,000** each occurrence, **\$2,000,000** general aggregate limit, and **\$2,000,000** aggregate for products and completed operations, with defense costs payable in addition to policy limits. The policies shall be endorsed to provide Broad Form Property Damage Coverage.
  - B. Comprehensive Automobile Liability Insurance covering all owned, non-owned, and hired vehicles. Such insurance shall provide coverage not less than the standard Comprehensive Automobile Liability policy with limits not less than **\$2,000,000** each occurrence Bodily Injury, and **\$2,000,000** each occurrence Property Damage.
  - C. All-Risk Course of Construction Insurance including damage to property owned by City, Contractor or third parties caused by fire. Insurance shall be in the amount of 100 percent of the completed value of the Work to be performed under this Contract. Deductible shall not exceed \$10,000. Each loss shall be borne by Contractor.
  - D. Workers’ Compensation Insurance for all persons whom the Contractor may employ in carrying out Work contemplated under Contract Documents, in accordance with the Act of Legislature of State of California, known as “Workers’ Compensation Insurance and Safety Act,” approved May 26, 1913, and all acts amendatory or supplemental thereto, in the statutory amount. Workers’ Compensation Insurance is **\$1,000,000** each accident, with defense cost payable in addition to policy limits.
  - E. Environmental Impairment Liability Insurance covering bodily injury and property damage utilizing an occurrence policy form, in an amount no less than **\$1,000,000** combined single limit for each occurrence, subject to a **\$1,000,000** aggregate applicable to each job, with defense costs payable in addition to policy limits. The minimum deductible or self-insured retention permissible is **\$25,000** each occurrence.
- 1.02 All policies of insurance shall be placed with insurers acceptable to City. The insurance underwriter(s) for all insurance policies except Workers’ Compensation shall have an A. M. Best Company rating of A-, VIII or better, unless otherwise specified in Contract Documents. Required minimum amounts of insurance may be increased should conditions of Work, in opinion of City, warrant such increase. Contractor shall increase required insurance amounts upon direction by City.**
- 1.03 Required Endorsements: The policies required under Document 00 7200 (General Conditions) and this Document 00 7316 shall be endorsed as follows:**
- A. City of Berkeley, its officers, agents, volunteers, consultants, and employees shall be named as additional insureds, but only with respect to liability arising out of the activities of the named insured, and there shall be a waiver of subrogation as to each named and additional insured.
  - B. Each such policy shall apply separately to each insured against whom claim is made or suit is

- brought, except with respect to the limit of the insurance company's liability required hereunder. Should any of the policies identified herein contain a "cross-suits" exclusion, such exclusion must not apply to any additional insureds.
- C. Written notice of cancellation or of any limits reduction change in said policy shall be mailed to the City thirty (30) calendar days in advance of the effective date thereof, and ten (10) calendar days written notice to the same in advance of payment of any insurance claims under such policies to any person, firm or entity.
  - D. Insurance shall be primary insurance and no other insurance or self-insured retention carried or held by any named or additional insureds shall be called upon to contribute to a loss covered by insurance for the named insured.
- 1.04** Written notice of cancellation, non-renewal, or reduction in coverage of any policy shall be mailed to City (Attention: Project Manager and the Construction Manager) at the address listed in Document 00 5200 (Agreement), 30 calendar days in advance of the effective date of the cancellation, non-renewal, or reduction in coverage. Written notice of cancellation for non-payment shall be mailed within 10 calendar days of cancellation.
- 1.05** Certificates of insurance and endorsements shall have clearly typed thereon City Specification Number, and Title of Project of Contract Documents. Contractor shall maintain insurance in full force and effect during entire period of performance of Contract Documents.
- 1.06** Contractor shall keep insurance in force during warranty and guarantee periods, except that Contractor may discontinue All-Risk Course of Construction Insurance after Final Payment. At time of making application for extension of time, and during all periods exceeding the Contract Time resulting from any cause, Contractor shall submit evidence that insurance policies will be in effect during requested additional period of time. Upon City's request, Contractor shall submit to City, within 30 calendar days, copies of the actual insurance policies or renewals or replacements.
- 1.07** Contractor shall pay all insurance premiums, including any charges for required waivers of subrogation or the endorsement of additional insureds. If Contractor fails to maintain insurance, City may take out comparable insurance, and deduct and retain amount of premium from any sums due Contractor under Contract Documents.
- 1.08** If injury occurs to any employee of Contractor, Subcontractor or sub-subcontractor for which the employee, or the employee's dependents in the event of employee's death, is entitled to compensation from City under provisions of the Workers' Compensation Insurance and Safety Act, as amended, or for which compensation is claimed from City, City may retain out of sums due Contractor under Contract Documents, amount sufficient to cover such compensation, as fixed by the Act, as amended, until such compensation is paid, or until it is determined that no compensation is due. If City is compelled to pay compensation, City may, in its discretion, either deduct and retain from the Contract Sum the amount so paid, or require Contractor to reimburse City.
- 1.09** Nothing herein shall be construed as limiting in any way the extent to which Contractor or any Subcontractor may be held responsible for payment of damages resulting from their operations.
- 1.10** All Subcontractors shall maintain the same insurance required to be maintained by Contractor with respect to their portions of the Work unless otherwise indicated in Contract Documents, and Contractor shall cause the Subcontractors to furnish proof thereof to City within ten calendar days of City's request.
- 1.11** The following provisions apply to any licensed professional engaged by Contractor to perform portions of the Work ("Professional").
- A. Each Professional shall maintain the following insurance, unless otherwise specified in Contract Documents:
  - B. Professional Liability Insurance, insuring against professional errors and omissions arising from Professional's Work on the Project, in an amount not less than **\$2,000,000** combined single limit for each occurrence. If Professional cannot provide an occurrence policy, Professional shall

provide insurance covering claims made as a result of performance of Work on this Project and shall maintain such insurance in effect for not less than two years following Final Completion of the Project.

- C. Professional shall satisfy all other provisions of this Document 00 7316 relating to that insurance, including without limitation providing required insurance certificates (containing the required endorsements) before commencing its Work on the Project.

## **ARTICLE 2 – RESPONSIBILITY OF CONTRACTOR AND INDEMNIFICATION**

- 2.01** City and each of its officers, employees, consultants and agents including, but not limited to, the Board, Project Manager and Construction Manager and each City's Representative, shall not be liable or accountable in any manner for loss or damage that may happen to any part of the Work; loss or damage to materials or other things used or employed in performing the Work; injury, sickness, disease, or death of any person; or damage to property resulting from any cause whatsoever except their sole negligence, willful misconduct or active negligence, attributable to performance or character of the Work, and Contractor releases all of the foregoing persons and entities from any and all such claims.
- 2.02** To the furthest extent permitted by law (including without limitation California Civil Code §2782), Contractor shall assume defense of, and indemnify and hold harmless, City and each of its officers, employees, consultants and agents, including but not limited to the Board, Project Manager and Construction Manager and each City's Representative, from claims, suits, actions, losses and liability of every kind, nature and description, including but not limited to claims and fines of regulatory agencies and attorney's fees and consultant's fees, directly or indirectly arising out of, connected with or resulting from performance of the Work, failure to perform the Work, or condition of the Work which is caused in whole or part by any act or omission of Contractor, Subcontractors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, resulting from any cause whatsoever except their sole negligence, willful misconduct or active negligence.
- 2.03** With respect to third-party claims against Contractor, Contractor waives any and all rights to any type of express or implied indemnity against City and each of its officers, employees, consultants and agents including, but not limited to City, the Board, Project Manager and Construction Manager and each City's Representative. City shall provide timely notice to Contractor of any third-party claim relating to the Contract Documents, in accordance with Section 9201 of the California Public Contract Code.
- 2.04** Approval or purchase of any insurance contracts or policies shall in no way relieve from liability nor limit the liability of Contractor, its Subcontractors of any tier, or the officers or agents of any of them.
- 2.05** To the furthest extent permitted by law (including, without limitation, Civil Code §2782), the indemnities, releases of liability and limitations of liability, claims procedures, and limitations of remedy expressed throughout Contract Documents shall apply even in the event of breach of Contract, negligence (active or passive), fault or strict liability of the party(ies) indemnified, released, or limited in liability, and shall survive the termination, rescission, breach, abandonment, or completion of the Work or the terms of the Contract Documents. If Contractor fails to perform any of these defense or indemnity obligations, City may in its discretion back charge Contractor for City's costs and damages resulting therefrom and withhold such sums from progress payments or other Contract moneys which may become due.
- 2.06** The indemnities in the Contract Documents shall not apply to any indemnified party to the extent of its sole negligence or willful misconduct; nor shall they apply to City or other indemnified party to the extent of its active negligence.

**END OF DOCUMENT**



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**DOCUMENT 00 7317****SUPPLEMENTARY CONDITIONS – CITY OF BERKELEY CONTRACTING POLICIES****ARTICLE 1 – GENERAL****1.01 DESCRIPTION**

- A. This document includes requirements which supplement the sections of the General Conditions.

**1.02 PROHIBITED DISCRIMINATION.** The following paragraphs shall be added to the General Conditions as a new Article 16.A, and, with the additions set forth in paragraphs 1.03 through 1.08, below, shall constitute a new Section 16 of Document 00 7200, General Conditions, entitled “16: City of Berkeley Contracting Policies”.

“16. A PROHIBITED DISCRIMINATION: During prosecution of the Work to be done under the Contract, Contractor shall comply with the provisions of Berkeley Municipal Code (“B.M.C.”) Chapter 13.26, including, but not limited to, the following:

1. Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, ancestry, national origin, age (over 40), sex, pregnancy, marital status, disability, sexual orientation or AIDS.
2. Contractor shall permit the City access to records of employment, employment advertisements, application forms, EEO-1 forms, affirmative action plans and any other documents which, in the opinion of the City, are necessary to monitor compliance with this non-discrimination provision. In addition, Contractor shall submit forms supplied by the City to monitor this non-discrimination provision.”

**1.03 CONFLICTS OF INTEREST PROHIBITED.** The following paragraphs shall be added to Document 00 7200, General Conditions, as a new Section:

“16. B CONFLICTS OF INTEREST PROHIBITED:

1. In accordance with Government Code section 1090, Berkeley City Charter section 36 and B.M.C. Chapter 3.64, neither Contractor nor any employee, officer, director, partner or member of Contractor or immediate family member of any of the preceding, shall have served as an elected officer, an employee, or a City board, committee or commission member, who has directly or indirectly influenced the making of the Agreement.
2. In accordance with Government Code section 1090 and the Political Reform Act, Government Code section 87100 *et seq.*, no person who is a director, officer, partner, trustee, employee or consultant of the Contractor, or immediate family member of any of the preceding, shall make or participate in a decision made by the City or a City board, commission or committee, if it is reasonably foreseeable that the decision will have a material effect on any source of income, investment or interest in real property of that person or Contractor.
  - a. Interpretation of this section shall be governed by the definitions and provisions used in the Political Reform Act, Government Code section 87100 *et seq.*, its implementing regulations, manuals and codes, Government Code section 1090, Berkeley City Charter section 36 and B.M.C. Chapter 3.64.”

- 1.04** NUCLEAR FREE BERKELEY ORDINANCE. The following paragraphs shall be added to Document 00 7200, General Conditions, as a new Section:

“16. C NUCLEAR FREE BERKELEY ORDINANCE:

1. Contractor agrees to comply with B.M.C. Chapter 12.90, the Nuclear Free Berkeley Act, as amended from time to time.”

- 1.05** CONTRACTUAL RELATIONS WITH PROHIBITED ENTITIES. The following paragraphs shall be added to Document 00 7200, General Conditions, as a new Section:

“16. D CONTRACTUAL RELATIONS WITH PROHIBITED ENTITIES

1. OPPRESSIVE STATES

- a. In accordance with Resolution No. 59,853-N.S. (Appendix 00812-A), Contractor certifies that it has no contractual relations with, and agrees during the term of this agreement to forego contractual relations to provide personal services to, the following entities:
  1. The governing regime in any Oppressive State.
  2. Any business or corporation organized under the authority of the governing regime of any Oppressive State.
  3. Any individual, firm, partnership, corporation, association, or any other commercial organization, and including parent-entities and wholly-owned subsidiaries (to the extent that their operations are related to the purpose of its contract with the City), for the express purpose of assisting in business operations or trading with any public or private entity located in any Oppressive State.
- b. Appendix A to Resolution No. 59,853-N.S., and Resolution No. 60,382-N.S. and 70,606-N.S. designates the following as Oppressive States for the purposes of this Contract:
  1. Tibet Autonomous Region and the provinces of Amdo, Kham, and U-Tsang; and Burma (Myanmar)
- c. Contractor’s failure to comply with this section shall constitute a default of this Contract and City may terminate the Contractor’s right to proceed with the Work pursuant to Document 00 7200, General Conditions, Article 14.05.
  1. In the event that the City terminates Contractor due to a default under this provision, City may deem Contractor a non-responsible bidder for five (5) years from the date this Contract is terminated.”

- 1.06** REQUIRED AND PROHIBITED WORK MATERIALS. The following paragraphs are added to Document 00 7200, General Conditions, as a new Section:

“16. E REQUIRED AND PROHIBITED WORK MATERIALS

1. RECYCLED PAPER

- a. If Contractor is required by this Agreement to prepare a written report or study, Contractor shall use recycled paper for said report or study when such paper is available at a cost of not more than ten percent more than the cost of virgin paper, and when such paper is available at the time it is needed. For the purposes of this Agreement, recycled paper is paper that contains at least 50% recycled product. If recycled paper is not available, Contractor shall use white paper. Written reports or studies prepared under this Agreement shall be printed on both sides of the page whenever practical.

#### TROPICAL HARDWOODS

- a. Contractor shall comply with the terms of Resolution No. 58,291-N.S. (Appendix 00812-B) prohibiting the use of any tropical hardwood or wood product, including, but not limited to, those enumerated in Resolution No. 58,291-N.S. Contractor must submit, with its bid, a statement Tropical Hardwood Disclosure form.
- b. Except as expressly permitted by the application of Sections 3.B and 4.B. of Resolution No. 58,291-N.S., Contractor shall not provide any items to the City in performance of this contract which are tropical hardwoods or tropical wood products.
- c. Contractor's failure to comply with this section shall constitute a default of this Agreement and Contractor agrees that City may take any of the following actions:
  1. terminate the Contractor's right to proceed with the Work pursuant to Document 00 7200, General Conditions, Article 14.05;
  2. withhold funds due the Contractor under any contract with the City;
  3. order revision of the Contract Documents based upon a material breach of Contract Documents provisions or pertaining to representations made in bidding, execution or performance of the Contract Documents;
  4. disqualify the Contractor from eligibility for providing commodities or services to the City for a period not to exceed five (5) years, with a right to review and reconsideration by the City after two (2) years upon a showing of corrective action, indicating violations are not likely to recur.
- d. Notwithstanding Article 4 of the Agreement, Contractor acknowledges and agrees that its failure to comply with this requirement justifies the imposition of liquidated damages in an amount equal to Contractor's net profit, or five percent (5%) of the total contract amount, whichever is greater.
  1. Liquidated damages under this provision shall be payable to the City upon demand and may be set off against any monies due to the Contractor from any contract with the City.

#### 3. VIRGIN REDWOOD

- a. Contractor agrees to comply with the City Council's October 29, 1996, directive not to purchase virgin redwood for the prosecution of the work to be done under this Contract and in its place purchase and use:
  1. Redwood that has been previously used or;
  2. Certified, sustainable-harvested redwood as the preferred alternative to virgin

and non-certified redwood, and not pressure-treated lumber of other species as an alternative to redwood.”

#### 4. TREATED WOOD

- a. Contractor shall comply with the terms of Resolution No. 61,724-N.S. (Appendix 00812-E) prohibiting the use of Pentachlorophenol, arsenic and creosote treated wood. No such wood shall be used by the contractor in this or any other City project without the express written consent of the City Council.

**1.07 FIRST SOURCE HIRING REQUIREMENT. The following paragraphs shall be added to Document 00 7200, General Conditions, as a new Section if the contract exceeds \$100,000 but is less than \$500,000:**

“16. F FIRST SOURCE HIRING REQUIREMENT

1. Contractor, and any subcontractors, shall utilize the City's First Source Construction Program under the terms set forth in the First Source specifications. (Appendix 00812-C).
  - a. Under the First Source program, Contractor must employ, to the extent possible, a work force where no less than twenty-five percent of the work hours are performed by Berkeley residents, and fifty percent of all new hires are Berkeley residents, on a craft-by-craft basis.
  - b. To achieve the goals, Contractor may either:
    1. Utilize the City's First Source referral service, or
    2. Demonstrate a good faith effort to achieve the goals.”

OR

**1.07 COMMUNITY WORKFORCE AGREEMENT. The following paragraph shall be added to Document 00700 (General Conditions) as a new Section if the contract exceeds \$500,000.**

“16.F COMMUNITY WORKFORCE AGREEMENT

1. Contractor and any subcontractor at any tier shall comply with the City's Community Workforce Agreement set forth in the Appendix 00812 C.
  - a. Under the Community Workforce Agreement, Contractor must sign and comply with the Agreement to be Bound prior to execution of the Contract.
  - b. Subcontractors at any tier must also sign and comply with an Agreement to be Bound prior to execution of their respective subcontracts.
  - c. The signing of an Agreement to be Bound is a condition precedent to entering into any contract for this project.”

**1.08 EQUAL BENEFITS ORDINANCE. The following paragraph shall be added to Document 00700 (General Conditions) as a new Section:**

“16.G EQUAL BENEFITS ORDINANCE:

1. Contractor hereby agrees to comply with the provisions of the Berkeley Equal Benefits Ordinance, B.M.C. Chapter 13.29 (Appendix 00812-D). If Contractor is currently subject to the Berkeley Equal Benefits Ordinance, as indicated by the Equal Benefits Certification form, as contained in Document 00680, Contractor will be required to provide all eligible employees with City mandated equal benefits, as defined in B.M.C. Chapter 13.29, during the term of this contract, as well as comply with the terms enumerated herein.
2. If Contractor is currently or becomes subject to the Berkeley Equal Benefits Ordinance, Contractor agrees to provide the City with all records the City deems necessary to determine compliance with this provision. These records are expressly subject to the auditing terms described in Document 00 7200, General Conditions, Article 8.02.
3. If Contractor fails to comply with the requirements of this Article, City shall have the rights and remedies described in this Section, in addition to any rights and remedies provided by law or equity.
  3. Contractor's failure to comply with this Article shall constitute a material breach of the Contract, upon which City may terminate the Contractor's right to proceed with the Work pursuant to Document 00 7200, General Conditions, Article 14.05. In the event the City terminates the Contractor's right to proceed with the Work due to a default by Contractor under this Article, the City may deem Contractor a non-responsible bidder for not more than five (5) years from the date this Contract is terminated. In addition, at City's sole discretion, Contractor may be responsible for liquidated damages in the amount of \$50.00 per employee per day for each and every instance of violation of this Section. It is mutually understood and agreed that Contractor's failure to provide its employees with equal benefits will result in damages being sustained by City; that the nature and amount of these damages will be extremely difficult and impractical to fix; that the liquidated damages set forth herein is the nearest and most exact measure of damages for such breach that can be fixed at this time; and that the liquidated damage amount is not intended as a penalty or forfeiture for Contractor's breach. City may deduct any assessed liquidated damages from any payments otherwise due Contractor.

**1.09** SANCTUARY CITY CONTRACTING: The following paragraph shall be added to Document 00700 (General Conditions) as a new Section:

"16. H SANCTUARY CITY ORDINANCE:

1. Contractor hereby agrees to comply with the provisions of the Sanctuary City Contracting Ordinance, B.M.C. Chapter 13.105. In accordance with this Chapter, Contractor agrees not to provide the U.S. Immigration and Customs Enforcement Division of the United States Department of Homeland Security with any Data Broker or Extreme Vetting Services as defined herein:
  - a. "Data Broker" means either of the following:
  - ii. The collection of information, including personal information about consumers, from a wide variety of sources for the purposes of reselling such information to their customers, which include both private-sector business and government agencies;

- iii. The aggregation of data that was collected for another purpose from that for which it is ultimately used.
- b. “Extreme Vetting” means data mining, threat modeling, predictive risk analysis, or other similar services. Extreme Vetting does not include:
  - i. The City’s computer-network health and performance tools;
  - ii. Cybersecurity capabilities, technologies and systems used by the City of Berkeley Department of Information Technology to predict, monitor for, prevent, and protect technology infrastructure and systems owned and operated by the City of Berkeley from potential cybersecurity events and cyber-forensic based investigations and prosecutions of illegal computer based activity.”

SCHEDULE OF APPENDENCES  
TO  
MODIFICATIONS TO GENERAL CONDITIONS

Schedule of Exhibits: (the following Exhibits are on file at the Berkeley City Clerk's office and will be made available on request to any interested party)

- A. City Council Resolution No. 59,853-N.S. (Re: Oppressive States).
- B. City Council Resolution No. 58,291-N.S. (Re: Tropical Hardwoods).
- C. City Council Resolution No. 61,724-N.S. (Re: Treated Wood).
- D. Berkeley Municipal Code, Chapter 13.29, Equal Benefits Ordinance
- E. Specifications for City's First Source Construction Program, for contracts between \$100,000 and \$500,000.
- F. Community Workforce Agreement and Agreement to be Bound for contract exceeding \$500,000.
- G. Sanctuary City Contracting Ordinance, B.M.C. Chapter 13.105.

**END OF DOCUMENT**





**DOCUMENT 00 7319****SUPPLEMENTARY CONDITIONS – HEALTH AND SAFETY REQUIREMENTS;  
HAZARDOUS MATERIALS****ARTICLE 1 – GENERAL****1.01 Summary**

- A. This document includes requirements as they apply to location, removal, remediation and disposal of hazardous materials and hazardous waste.

**1.02 HAZARDOUS MATERIALS SURVEY**

- A. Reference Section 01 1100, Part 1.15 for a list of available documents, including any Hazardous Materials Surveys, if available.
- B. Data regarding the locations of hazardous materials was obtained only for use of City and its consultants, contractors, and tenants for planning and design and are not part of Contract Documents.
- C. Bidders may rely on this data and information for general accuracy regarding the locations of potentially hazardous materials subject of the Work. City does not warrant and makes no representation regarding the completeness or thoroughness of any data or information regarding existing conditions or hazardous materials, including, but not limited to, quantities, characteristics, volumes, or associated structural features. Bidder represents and agrees that in submitting a Bid it is not relying on any such data, information or deductions.
- D. Before submitting a Bid, each Bidder shall be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site or otherwise, which may affect cost, progress, performance or furnishing of Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of Contract Documents.
- E. Bidders shall advise City in writing during the Bid period of any questions, suppositions, inferences or deductions Bidders may have for City's review and response. City has provided time in the period prior to bidding for Bidder to perform these investigations.
- F. During the Pre-Bid Site Visit(s), City will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidders must fill all holes and clean up and restore the Site to its former conditions upon completion of such explorations, investigations, tests, and studies. Such investigations may be performed only under the provisions of Document 00 2113 (Instructions to Bidders) and Document 00 7200 (General Conditions) including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such investigation work. Each Bidder shall supply all equipment required to perform any investigations as each Bidder deems necessary. City has the right to limit the number of pieces of machinery operating at one time due to safety concerns.

**1.03 Precedence of Documents**

- A. Should any provision or requirement of any Contract Document conflict with another provision or requirement in the Contract Documents on subject matters of hazardous waste abatement, clean up, disposal, or required safety standards or methods, then the most stringent provision or requirement shall control.

**1.04 Means and Methods of Construction**

- A. Nothing contained in these Contract Documents or inferable therefrom shall be deemed or

construed (1) to make Contractor the agent, servant or employee of City, or (2) to create any partnership, joint venture or other association between City and Contractor.

#### **1.05 Control of the Work**

- A. City shall exercise administration of the Contract. The City may employ a consultant to assist. City reserves the right to assign or delegate to this consultant, or any other consultant ("Consultant") any or all of the responsibilities of the Architect/Engineer under the Contract Documents, or alternatively, to act as City's representative.
- B. Contractor shall cooperate with Consultant as directed by City. Consultant's duties may include observing the Contractor's health and safety program and practices, observing the abatement construction activities, observing the contractor's abatement work practices for compliance with the Contract Documents, observing the extent of material removed from each job site, reviewing payment requests, reviewing reports required by governmental or quasi-governmental agencies or the Contract Documents, and providing clearance tests after abatement is completed. No action, omission to act, approval, or failure to advise Contractor as to any matter by Consultant shall in any way relieve the Contractor from its responsibility for the performance of the Work in strict accordance with the Contract Documents and applicable Law.

#### **1.06 Warranty, Guarantee and Inspection of Work.**

- A. Contractor represents and warrants that it, its employees and its subcontractors and their employees, shall at all times have the required levels of familiarity with the Site and the Work, training and ability to comply fully with all applicable Law and contract requirements for safe and expeditious performance of the Work, including whatever training is or may be required regarding the activities to be performed (including, but not limited to, all training required to adequately address the actual or potential dangers of contract performance).
- B. Contractor represents and warrants that it, its employees and its subcontractors and their employees, shall at all times have and maintain in good standing any and all certifications and licenses required by applicable federal, state and other governmental and quasi-governmental requirements applicable to the Work.
- C. Contractor represents and warrants that it has studied carefully all requirements of the specifications regarding procedures for demolition, hazardous waste abatement, or safety practices, specified in this contract, and prior submitting its bid, has either (a) verified to its satisfaction that the specified procedures are adequate and sufficient to achieve the results intended by the Contract Documents, or (b) by way of approved "or equal" request or request for clarification and written Addenda, secured changes to the specified procedures sufficient to achieve the results intended by the Contract Documents. Contractor accepts the risk that any specified procedure will result in a completed project in full compliance with the contract requirements.
- D. City reserves the right, in its sole discretion, to conduct air monitoring, earth monitoring, work monitoring, and any other tests (in addition to testing required under the agreement or applicable law), to monitor contract requirements of safe and statutory compliant work methods and (where applicable) safe re-entry level air standards under State and Federal law upon completion of the job, and compliance of the work with periodic and final inspection of public and quasi-public entities having jurisdiction.
- E. Contractor acknowledges that City also has the right to perform, or cause to be performed, various activities and tests including, but not limited to, pre-abatement, during abatement and post-abatement air monitoring, provided that City shall have no obligation to perform said activities and tests, and that a portion of said activities and tests may take place prior to the completion of the Work by Contractor. In the event City elects to perform these activities and tests, Contractor shall afford City ample access to the Site and all areas of the Work as may be necessary for the performance of these activities and tests. Contractor will include the potential impact of these activities for tests by City in the Contract Sum and the Scheduled Completion Date. Contractor shall not be entitled to increases in the contract sum or any damages for delay in the event City elects to perform these activities and tests, provided any delays resulting therefrom are reasonable under the circumstances involved. Notwithstanding City's rights

granted by this paragraph, Contractor shall retain its own industrial hygiene consultant and shall have primary responsibility for collecting samples and perform all applicable, relevant or appropriate activities and tests including, but not limited to, pre-abatement, during abatement and post-abatement air monitoring, required or suggested by the Contract Documents, the Law, or both, and City reserves the right to request documentation of all such activities and tests performed by Contractor relating to the Work.

#### **1.07 RECORDS**

- A. Contractor shall obtain and maintain and shall furnish to City on completion of the Work, or at any other time requested by City, all necessary permits, licenses, approvals, authorizations, notifications, training certificates, respirator certificates, reports, correspondence, test results, air monitoring certificates, forms, medical records, medical certificates, notes and photographs of work conditions, approved shipping and disposal facility receipts, manifests, and all other documentation required by the Contract Documents or applicable Law, or both.
- B. Contractor shall provide City with copies of each such document as it is generated and shall, as a condition to final payment, provide City with a complete set of such documents (bound, organized and indexed) at the conclusion of the Work. Contractor shall keep and maintain in retrievable files true and correct copies of all such documents for a period of not less than thirty (30) years after final completion of the Work. City shall have the right to inspect or photocopy these records and, if Contractor should cease business operations, then it shall furnish these records to City.

#### **1.08 Compliance with laws**

- A. Contractor represents that it is familiar with shall comply with all laws applicable to the Work or completed Work including, but not limited to, all federal, state and local laws, statutes standards, rules, regulations and ordinances applicable to the Work (collectively, the "Law") relating to:
  - 1. the protection of the public health, welfare and environment;
  - 2. storage, handling or use of asbestos, PCB, lead, petroleum based products or other hazardous materials;
  - 3. the generation, processing, treatment, storage, transport, disposal, destruction or other management of asbestos, PCB, lead, petroleum or hazardous waste materials or other waste materials of any kind; or,
  - 4. the protection of environmentally sensitive areas such as wetlands.
- B. Contractor has the sole responsibility for determining current waste storage, handling, transportation and disposal regulations for the jobsite and for each waste disposal facility. Contractor must comply fully at its sole cost and expense with these regulations and any applicable Law. City, may, but is not obligated to, require submittals with this information for it to review consistent with the Contract Documents.
- C. Contractor shall develop and implement a system acceptable to City to track hazardous waste from the site to disposals, including appropriate "Hazardous Waste Manifests" on the EPA form, so that City may track the volume of waste it put in each landfill and receive from each landfill a certificate of receipt.
- D. Contractor shall provide City with the name and address of each waste disposal facility prior to any disposal, and City shall have the express right to reject any proposed disposal facility. Contractor shall not use any disposal facility to which City has objected. Contractor shall document actual disposal or destruction of waste at a designated facility by completing a disposal certificate or certificate of destruction forwarding the original to the general contractor.

#### **1.09 Permits**

- A. Before performing any of the Work, and at such other times as may be required by applicable Law, Contractor shall deliver all requisite notices and obtain the approval of all governmental and quasi-governmental authorities having jurisdiction over the Work. Contractor shall submit evidence satisfactory to City that it and any disposal facility (1) have obtained all required permits, approvals and the like in a timely manner both prior to commencement of the Work and thereafter as and when required by applicable Law, and (2) are in compliance with all such permits,

approvals and the like. For example, before commencing any work in connection with the Work involving asbestos-containing materials or PCB subject to regulation, Contractor agrees to provide the required notice of intent to renovate or demolish to the appropriate state or federal agency having jurisdiction, by certified mail, return receipt requested, or by some other method of transmittal for which a return receipt is obtained, and to send a copy of that notice to City. Contractor shall not conduct any Work involving asbestos-containing materials or PCB unless Contractor has first confirmed that the appropriate agency having jurisdiction is in receipt of the required notification. All permits, licenses, bonds required by governmental or quasi-governmental authorities, fees, deposits, tap fees, offsite easements and asbestos and PCB disposal facilities necessary for the prosecution of the Work shall be procured and paid for by Contractor. Contractor shall give all notices and comply with the Law bearing on the conduct of the Work as drawn and specified. If Contractor observes or reasonably should have observed that Plans and Specifications and other Contract Documents are at variance therewith, it shall be responsible for promptly notifying City in writing of such fact. If Contractor performs any Work contrary to the Law without such notice to City, it shall bear all costs arising therefrom.

- B. In the case of any permits or notices held in City's name or of necessity to be made in City's name, City shall cooperate with Contractor in securing the permit or giving the notice, but the Contractor shall prepare for City's review and execution upon approval, all necessary applications, notices and other materials.

#### **1.10 Indemnification and Termination**

- A. To the extent permitted by law, the indemnities and limitations of liability expressed throughout the Contract Documents apply with equal force and effect to any claims or liabilities imposed or existing by virtue of the removal, abatement and disposal of hazardous waste. This includes liabilities connected to the selection and use of a waste disposal facility, personal injury, property damage, loss of use of property, damage to the environment or natural resources, or "disposal" and "release" of materials associated with the Work (as defined in 42 U.S.C. 9601 *et seq*).
- B. Notwithstanding anything in Document 00 7200 to the contrary, City shall have an absolute right to terminate the Contractor's right to proceed with the Work for cause immediately, without ten calendar days notice and without an opportunity to cure, should Contractor knowingly or recklessly commit a material breach of the terms of the Contract Documents or the Law, on any matter involving the exposure of persons or property to hazardous waste. However, if the breach of contract exposing persons or property to hazardous waste is due solely to an ordinary, unintentional and non-reckless failure to exercise reasonable care, then the procedures in Document 00 7200, Article 14.05, shall apply without modification.

#### **1.11 Protection of Work, Persons and Property**

- A. Contractor shall perform safe, expeditious and orderly work in accordance with the best practices and the highest standards in the hazardous waste abatement, removal and disposal industry, the Law (as herein defined), and the Contract Documents, including, but not limited to, all responsibilities relating to the preparation and return of waste shipment records, all requirements of the Law, delivering of all requisite notices, and obtaining all necessary governmental and quasi-governmental approvals.

**END OF DOCUMENT**

**DOCUMENT 00 7380****APPRENTICESHIP PROGRAM****ARTICLE 1 – COMPLIANCE REQUIRED**

- 1.01** Contractor and Subcontractors shall comply with the requirements of California Labor Code §§1776, 1777.5, and 1777.6 concerning the employment of apprentices by Contractor or Subcontractors. Willful failure to comply may result in penalties, including loss of the right to Bid on or receive public works contracts.

**ARTICLE 2 – CERTIFICATION OF APPROVAL**

- 2.01** California Labor Code §1777.5, as amended, requires a Contractor or Subcontractor employing tradespersons in any apprenticeable occupation to apply to the joint apprenticeship committee nearest the site of a public works project and which administers the apprenticeship program in that trade for a certification of approval. The certificate shall also fix the ratio of apprentices to journeypersons that will be used in performance of the Contract. The ratio of work performed by apprentices to journeypersons in such cases shall not be less than one *hour* of apprentices work for every five *hours* of labor performed by journeypersons (the minimum ratio for the land surveyor classification shall not be less than one apprentice for each five journeypersons), except:
- A. When unemployment for the previous three month period in the area exceeds an average of 15 percent;
  - B. When the number of apprentices in training in the area exceeds a ratio of one to five;
  - C. When a trade can show that it is replacing at least 1/30 of its membership through apprenticeship training on an annual basis state-wide or locally; or
  - D. Assignment of an apprentice to any work performed under a public works contract would create a condition which would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyperson.

**ARTICLE 3 – FUND CONTRIBUTIONS**

- 3.01** Contractor is required to make contributions to funds established for administration of apprenticeship programs if Contractor employs registered apprentices or journeypersons in any apprenticeable trade on such contracts and if other contractors on the public works site are making such contributions.

**ARTICLE 4 – APPRENTICESHIP STANDARDS**

- 4.01** Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of the California Department of Industrial Relations, or from the Division of Apprenticeship Standards and its branch offices.

**END OF DOCUMENT**

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**DOCUMENT 00 9113**

**ADDENDA**

**SPECIFICATION NO. 23-11596-C**

**CITY OF BERKELEY**

WILLARD PARK CLUBHOUSE & RESTROOM REPLACEMENT

2720 HILLEGASS AVENUE

[DOCUMENT TO BE COMPLETED AS ADDENDA DURING BID PERIOD]

**[If a conformed copy is created, delete bracketed line above and replace with the following:]**

The following Addenda were issued, modifying the Project Manual:

Addendum No. 1, issued on **[date]**

Addendum No. 2, issued on **[date]**

[continue as appropriate]

(Addenda have been incorporated into the conformed Project Manual.)

**END OF DOCUMENT**



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## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 1100

## SUMMARY OF WORK

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section includes Summary of Work and Work Restrictions including:
1. Work Covered By Contract Documents
  2. Bid Item, Allowances and Alternates
  3. Contract Document Organization
  4. Maintenance
  5. Work Under Other Contracts
  6. Future Work
  7. Work Sequence
  8. Work Days and Hours
  9. Shutdown for Discovery of Cultural Resources
  10. Cooperation of Contractor and Coordination with Other Work
  11. Partial Occupancy/Utilization Requirements
  12. Contractor Use of Site
  13. Air Quality Standards
  14. Construction Staking, Monument Protection and Replacement
  15. Geotechnical Data and Existing Conditions
  16. Protection of Existing Structures and Underground Facilities
  17. Permits
  18. Actual Damages for Permit Violations
  19. Reference Standards
  20. Products Ordered in Advance
  21. City-Furnished Products

## 1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work comprises of the construction of City's **Willard Park Clubhouse & Restroom Replacement** located at **2720 Hillegass Avenue**. The Work includes, without limitation, **demolition of the existing, single-story, clubhouse, trellis, and restroom and construction of a new, single-story wood-framed multi-purpose community building, a stand-alone restroom, and a trash enclosure. Scope includes site work, building core and shell and interior improvements, as well as mechanical, electrical, plumbing, fire protection, audio alarm security systems (no CCTV).** Contract Documents fully describe the Work.
- B. The Work of this Contract comprises construction of all the Work indicated, described in the Specifications, or otherwise required by the Contract Documents. Unless provided otherwise in the Contract Documents, all risk of loss to Work covered by Contract Documents shall rest with Contractor until Final Acceptance of the Work. Cost of maintenance of systems and equipment prior to Final Acceptance will be considered as included in prices Bid and no direct or additional payment will be made therefore.
- C. For all Bid items, furnish and install all Work, including connections to existing systems, indicated and described in Specifications and all other Contract Documents. Work and requirements

applicable to each individual Bid item, or unit of Work, shall be deemed incorporated into the description of each Bid item (whether Lump Sum or Unit Price). Any Bid item may be deleted from the Work and Contract Sum, in total or in part, prior to or after award of Contract without compensation in any form or adjustment of other Bid items or prices therefore.

- D. Allowance Work shall be done as Change Orders and as specified in Section 01 2600 (Modification Procedures). Identify Allowance Items (See Document 00 4113 [Bid Form]) work on the Progress Schedules and on Applications for Payment. The Amount given on Document 00 4113 (Bid Form) under each Allowance Item is the sum of money set aside for each Allowance Item. These amounts shall be included in the Contract Sum on the Bid Form. If the cost of Work done under any Allowance Item is less than the amount given on the Bid Form under that Allowance Item, the Contract Sum shall be reduced by the difference between the amount given in the Bid Form and the cost of Work actually done.

### **1.03 BID ITEMS, ALLOWANCES AND ALTERNATES**

- A. Descriptions of Lump Sum Items (listed by Bid item numbers):
1. Demolition. This bid item shall include demolition work related to the building and the site as shown in the attached Demolition Permit Plans, specifications and other Contract Documents.
  2. Restroom - All labor, materials, services and equipment necessary for the completion of Work for the restroom, surrounding sitework and utilities as shown in the attached plans, specifications and other Contract Documents, except for that Work called for specifically in other Bid items and other Bid Alternates. Restroom - All labor, materials, services and equipment necessary for the completion of all of the Work shown in the attached plans, specifications and other Contract Documents, except for that Work called for specifically in other Bid items and other Bid Alternates.
  3. Clubhouse - All labor, materials, services and equipment necessary for the completion of Work for the clubhouse, surrounding sitework and utilities as shown in the attached plans, specifications and other Contract Documents, except for that Work called for specifically in other Bid items and other Bid Alternates. Restroom - Mechanical, Electrical, Plumbing systems. Contractor shall furnish and install all Work, including connections to existing systems.
  4. Fire protection systems. Contractor shall submit fire sprinkler calculations and piping plans, fire alarm (visual and audio) and monitoring/communication system, and exterior storefront system. Contractor shall furnish and install all work, including connections to existing systems.
  5. Solar and battery storage system. Contractor shall furnish and install all work, including connections to other systems.
- B. Descriptions of Unit Price Items and Basis of Measurement for Payment (listed by Bid item numbers): N/A
- C. Bid Alternates:
1. AV System in community rooms – ceiling speakers, projection screens/video displays, laptop AV connections, simple control system and audio playback for video. Contractor shall furnish and install all Work, including connections to associated systems.
  2. Pollinator garden along Derby Street. Contractor shall furnish and install all Work

### **1.04 CONTRACT DOCUMENT ORGANIZATION**

- A. The Drawings illustrate locations, arrangements, dimensions, and details to determine the general character of the Work. Parts not detailed shall be subject to the Architect's approval.

Where reasonably inferable that a Drawing illustrates only part of a given work on a number of items, the remainder shall be deemed repetitious and so construed. Drawings of greater scale take precedence over Drawings of lesser scale. Do not scale documents.

- B. Drawings indicate general arrangement and location of such items as piping, conduit, apparatus, and equipment. Drawings and Specifications are for guidance of the Contractor and exact locations, distances, and levels will be governed by building site and actual building conditions. The Contractor shall make minor changes, as directed, to arrangements or locations shown in order to meet Structural or Architectural conditions.
- C. Specifications describe performances and qualities required of materials and of methods. Items listed under each Section of the Specifications are not necessarily all inclusive. The Contractor shall be responsible for the complete work.
- D. For convenience, Specifications are separated into topical divisions of work, each of which is further related to topical divisions under which it occurs. Such separation shall not be construed as an attempt by the Architect to establish limits of any agreements between the Contractor and his/her subcontractors.
- E. Portions of these Specifications are of abbreviated, simplified type and may include incomplete sentences.
  - 1. Omissions of words or phrases such as "the Contractor shall", "in conformity with", "shall be", "as noted on the Drawings", "in accordance with the details", "a", "the", "all", "any", and "each" are intentional. Omitted words or phrases shall be supplied by inference.
  - 2. Terms such as "approved", "or approved equal", "as directed", "as required", "as provided", "acceptable", and "satisfactory" mean by or to the Architect or the City.
  - 3. Furnish: The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
  - 4. Install: The term install describes operations at the Project Site, including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar ions.
  - 5. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- F. Reference Standards
  - 1. For products specified by association or trade standards, comply with requirements of the standard except where more rigid requirements are specified or are required by applicable codes.
  - 2. The date of the standard is that in effect as of bid date except where specific date is specified

#### **1.05 MAINTENANCE**

- A. Cost of maintenance of systems and equipment prior to Final Acceptance will be considered as included in prices bid and no direct or additional payment will be made therefor.

#### **1.06 WORK UNDER OTHER CONTRACTS**

- A. None expected

#### **1.07 FUTURE WORK**

- A. None expected

#### **1.08 WORK SEQUENCE**

- A. Construct Work in stages and at times to accommodate City operation requirements during the construction period; coordinate construction schedule and operations with City.
- B. **Special operational constraints include the following:**
  - 1. Material submittals shall be submitted within 10 days of Notice to Proceed, or at least 30 days prior to when the material is needed at the job site.
  - 2. The following items have an anticipated lead time. The contractor shall plan accordingly to submit material submittals for review and approval by the City in advance of the work and when the material is needed on site.
    - a. Glazing
    - b. HVAC equipment
    - c. Electrical equipment
    - d. Site and Other furnishings

#### **1.09 WORK DAYS AND HOURS**

- A. Work Days and hours: Monday-Friday inclusive, **[7:00 a.m.-5:00 p.m.]** local time.
- B. Work at the Site on weekends or holidays is not permitted, unless Contractor requests otherwise from City in writing at least 48 hours in advance and City approves in its sole discretion.

#### **1.10 SHUTDOWN FOR DISCOVERY OF CULTURAL RESOURCES**

- A. If discovery is made of items of historical archaeological or paleontological interest, immediately cease all Work in the area of discovery. Archaeological indicators may include, but are not limited to, dwelling sites, locally darkened soils, stone implements or other artifacts, fragments of glass or ceramics, animal bones, human bones, and fossils. After cessation of excavation, immediately contact City. Do not resume Work until authorization is received from City. When resumed, excavation or other activities shall be as directed by City.

#### **1.11 COOPERATION OF CONTRACTOR AND COORDINATION WITH OTHER WORK**

- A. Coordinate with City and any City forces, or other contractors and forces, as required by Document 00 7200 (General Conditions).
- B. Employ a coordinator to constantly review Contract Documents, submittals, changes, and prepare overlay drawings as necessary to avoid conflicts, errors, omissions and untimely construction.

#### **1.12 PARTIAL OCCUPANCY/UTILIZATION REQUIREMENTS**

- A. Allow City to take possession of and use any completed or partially completed portion of the Work during the progress of the Work as soon as is possible without interference to the Work.
- B. Possession, use of Work, and placement and installation of equipment by City shall not in any way evidence the completion of the Work or any part of it.
- C. Contractor shall not be held responsible for damage to the occupied part of the Work resulting from City occupancy.
- D. Make available, in areas occupied, on a 24 hour per day and 7 day per week basis if required, any utility services, heating, and cooling in condition to be put in operation at the time of occupancy.
  - 1. Responsibility for operation and maintenance of said equipment shall remain with Contractor.
  - 2. Make, and City shall certify, an itemized list of each piece of equipment so operated with the

date operation commences.

3. Itemized list noted above shall be basis for commencement of warranty period for equipment.
4. City shall pay for utility cost arising out of occupancy by City during construction.
- E. Use and occupancy by City prior to acceptance of Work does not relieve Contractor of its responsibility to maintain insurance and bonds required under the Contract until entire Work is completed and accepted by City.
- F. Prior to date of Final Acceptance of the Work by City, all necessary repairs or renewals in Work or part thereof so used, not due to ordinary wear and tear, but due to Defective materials or workmanship or to operations of Contractor, shall be made at expense of Contractor, as required in Document 00 7200 (General Conditions).
- G. Use by City of Work or part thereof as contemplated by this Section 01 1100 shall in no case be construed as constituting acceptance of Work or any part thereof. Such use shall neither relieve Contractor of any responsibilities under Contract, nor act as waiver by City of any of the conditions thereof.
- H. City may specify in the Contract Documents that portions of the Work, including electrical and mechanical systems or separate structures, shall be substantially completed on dates described in this Section 01 1100, if any, prior to Substantial Completion of all of the Work. Notify City in writing when Contractor considers any such part of the Work ready for its intended use and Substantially Complete and request City to issue a Certificate of Substantial Completion for that part of the Work.

### **1.13 CONTRACTOR USE OF SITE**

- A. Access is available to the Site from **Regent Street, Derby Street, and Hillegass Avenue**. Contractor shall insert Contractor's own lock in series and ensure that the entrance is locked at the end of each work day and at other times as may be necessary to control unauthorized entry.
- B. Contractor shall contact City at least 2 Business Days prior to entering the building and performing Work to allow City to arrange access into the building. Access Request forms shall be submitted 48 hours in advance of anticipated on-site Work to gain permission to enter Site and to allow notification to occupants.
- C. Confine operations at Site to areas permitted by Contract Documents, permits, ordinances, and laws. Do not unreasonably encumber Site with materials or equipment.
- D. Assume full responsibility for protection and safekeeping of products stored on premises. Move any stored products that interfere with operations of City or other contractor.
- E. Coordinate parking, storage, staging, and Work areas with City. City will review and approve the proposed storage area for Contractor's equipment and materials. Do not store construction materials in the dripline of any tree.
- F. Prior to commencement of Work or excavation, Contractor and City shall jointly survey the area adjacent to the Project area making permanent note and record of such existing damage such as cracks, sags or other similar damage. This record shall serve as a basis for determination of subsequent damage to structures, conditions or other existing improvements due to Contractor's operations. All parties making the survey shall sign the official record of existing damage. Cracks, sags or damage of any nature to the adjacent Project area, not noted in the original survey but subsequently noted, shall be reported immediately to City.
- G. The Contractor shall follow all city ordinances in force during the duration of this Contract.
- H. It is essential that the Contractor perform the Work with as little interference and disturbance as

possible to the surrounding neighborhood.

- I. When suspect materials, outside the scope of Work, are encountered during the Work or restoration process, the Contractor shall immediately contact the Project Manager for evaluation and approval of the methods for dealing with the material.

#### **1.14 AIR QUALITY STANDARDS**

- A. Ensure that idling time for all heavy equipment is minimized to reduce on-Site emissions.
- B. Maintain equipment in good mechanical condition.
- C. Cover trucks hauling dirt.
- D. Limit dust emissions during periods of high winds (greater than 15 miles per hour).
- E. Replace ground cover in disturbed areas as soon as possible.
- F. Enclose, cover, water, or apply soil binders to exposed stockpiles.
- G. Remove earth tracked onto neighboring paved roads at least once daily.
- H. Limit equipment speed to 10 miles per hour in unpaved areas.
- I. Refer to section 01 8119 for standards on indoor air quality.

#### **1.15 CONSTRUCTION STAKING, MONUMENT PROTECTION AND REPLACEMENT**

- A. Notify City at least three (3) Business Days prior to the need for initial staking. City will provide engineering surveys, City benchmarks, corner records, reference points, and/or monument cards that in City's judgment are necessary to establish site elevations for the Contractor to establish construction stakes in order to enable Contractor to proceed with the Work.
- B. If Contractor finds any additional information is necessary, notify City in writing 2 Business Days in advance. City shall have no liability for any inadequacy unless Contractor notifies City and City fails to cure within 3 Business Days of such notice.
- C. Contractor shall be responsible for laying out the Work and provide all construction staking. Contractor shall replace or repair construction stakes at own expense.
- D. Contractor shall perform brush clearing and traffic control, as necessary, in City's sole judgment.
- E. The Contractor shall protect and preserve all existing survey monuments, benchmarks, reference points, property monuments and stakes.
- F. Whenever Contractor knows or reasonably should know that any Work activity is likely to damage or destroy any survey monuments, benchmarks, reference points, property monuments, or construction stakes, or require relocation because of necessary changes in grades or locations, provide at least 3 Business Days advance notice to City. Survey monuments, benchmarks, reference points and property monuments shall not be disturbed until authorized by the City.
- G. Whenever the Contractor disturbs or removes any survey monuments, benchmarks, reference points, or property monuments, the Contractor shall replace the monument in accordance with City Standard Plan 8090 or City Standard Plan 8091, as applicable. Standard Plans are available upon request. Monument casings (boxes and lids) shall be provided by the Contractor, and dome brass markers shall be supplied by the City.
- H. In the event that any non-referenced monuments become in danger of being disturbed due to construction, the Contractor shall cease the threatening activity and notify the City immediately. Response to endangered monuments is a priority call, and each monument shall be referenced in accordance with the City of Berkeley Monument Reference Guidelines, available upon request.

In no case may an unreferenced monument be damaged during construction.

- I. Should any monument not designated for replacement sustain damage during construction, the Contractor shall bear the expense for rebuilding it as well as for the survey work the City survey crew or its survey consultant must perform in the process. In any instance where the City deems a damaged monument to be irreplaceable, the contractor shall be fined \$20,000 per monument.
- J. Monument replacement must be done in a neat, workman-like manner. Pavement cuts shall be accurate, with vertical cuts to exact dimensions as shown on the Standard Plans. Monument boxes and lids shall be placed at the proper finished grade and as detailed by Standard Plan 8090 or Standard Plan 8091. Existing monument lids shall be salvaged by the Contractor and delivered to the City.
- K. Each replacement monument shall be constructed such that the center of the dome brass marker is set within 0.04 foot of the referenced position. The new dome brass marker shall not receive final punching prior to seven (7) calendar days after completion of the monument construction.
- L. In any event, notify City whenever any survey monuments, benchmarks, reference points, or property monuments are lost or destroyed or require relocation because of necessary changes in grades or locations.
- M. If the City has elected to reference known monuments around or within the project site, a copy of the corner records for the referenced monuments shall be provided to the Contractor prior to the start of construction. For each monument that has been disturbed or removed, the replacement monument location(s) will be established by the City's survey crew or its survey consultant after final pavement is completed and upon request by the Contractor.
- N. All City of Berkeley Monuments located within the project area must be referenced, prior to work commencing, by a licensed land surveyor as required by Section 8771 of the Business and Professions Code. Corner Records of this work must be submitted for filing to both the County Surveyor of Alameda County, and the City of Berkeley, Public Works Department, Engineering Division, Survey Section.
- O. Illegible survey requests or requests without proper notification (at least 3 Business Days in advance), may result in delayed response. No extension of Contract Time will be allowed due to such delays.

#### **1.16 GEOTECHNICAL DATA AND EXISTING CONDITIONS**

- A. Available Documentation: In accordance with, and subject to, the provisions of Document 00 3132 (Geotechnical Data and Existing Conditions), the following documentation is available for review. This information is not part of the Contract Documents.
  1. **Geotechnical Investigation Report**  
**Willard Park Clubhouse and Restroom Building**  
2720 Hillegass Avenue Berkeley, California  
BSK Associates  
April 13, 2022 (Revised 6/1/2022)

#### **1.17 PROTECTION OF EXISTING STRUCTURES AND UNDERGROUND FACILITIES**

- A. The Drawings may indicate existing above- and below-grade structures, drainage lines, storm drains, sewers, water lines, gas lines, electrical lines, hot water lines, and other similar items and Underground Facilities that are known to City. At least (2) two Business Days, or as otherwise noted, prior to commencement of excavation, notify the owners of the following Underground Facilities:
  1. **Water lines:** EBMUD



2. **Sewer lines:** Berkeley Public Works Department
  3. **Telephone Conduit:** Telephone Provider
  4. **Cable:** Cable Provider
  5. **Electrical Lines:** PG&E
- B. Where overhead service to a structure, known to receive service, does not exist, then underground service shall be assumed to exist.
  - C. Attention is also directed to the existence of overhead power and telephone lines.
  - D. Perform pot-holing by hand within 24 inches (in any direction) of the Underground Facilities. This may be done on an area-by-area basis, but shall be accomplished at least 7 calendar days in advance of the date of construction within such area.
  - E. No attempt has been made to locate utilities on private property such as sprinkler irrigation systems or electrical conduits on the project site or adjacent property. Contractor is responsible for contacting all property owners as necessary, and locating and marking utilities in the vicinity of the work prior to construction.
  - F. In addition to reporting, if a utility is damaged, Contractor must take appropriate action as provided in Document 00 7200 (General Conditions).
  - G. Additional compensation or extension of time on account of utilities not indicated or otherwise brought to Contractor's attention including reasonable action taken to protect or repair damage shall be determined as provided in Document 00 7200 (General Conditions).

#### 1.18 PERMITS

- A. Permits, agreements, or written authorizations that are known by City to apply to this Project are listed below:
  1. Storm Water Pollution Prevention
  2. Cal/OSHA Permit. Obtain, as applicable, permit(s) as required by Cal/OSHA for the following:
    - a. Construction of trenches or excavations that are five feet or more in depth and into which a person is required to descend.
    - b. Construction or demolition of any building, structure, or scaffolding for falsework more than three stories high, or the equivalent height (36 feet).
    - c. Erection or dismantling of vertical shoring systems more than three stories high, or the equivalent height (36 feet).
  3. The local Cal/OSHA district office is located at:

CAL/OSHA Headquarters  
1515 Clay Street, Suite 1303  
Oakland, CA 94612  
(510) 622-2916
- B. All other permits that may be required, such as electrical, mechanical, fire prevention, irrigation, grading, slope protection, tree cutting, etc., have not been applied for and shall be obtained by Contractor. Applicable permit fees will be reimbursed to the extent specified in Document 00 7200 (General Conditions).

#### 1.19 ACTUAL DAMAGES FOR PERMIT VIOLATIONS

- A. In addition to damages which are impracticable or extremely difficult to determine, for which liquidated damages will be assessed as described in Document 00 5200 (Agreement) and Document 00 7200 (General Conditions), City may incur actual damages, including fines imposed by any regulatory agency, resulting from **loss of use, or from** use in violation of legal or regulatory requirements where the violations result from Contractor's activities. Continuous operation in compliance with legal or regulatory requirements is essential to avoid discharges that would violate applicable regulations. Violations or threatened violations may subject City to fines and/or other costs or civil liabilities.
- B. Contractor shall be liable for and shall pay City the amount of any actual losses in addition to liquidated damages or other remedies provided by the Contract Documents.
- C. The amount of liquidated damages provided in Document 00 5200 (Agreement) and Document 00 7200 (General Conditions) is not intended to include, nor does the amount include, any damages incurred by City for reasons other than those listed in that paragraph. Any money due or to become due to Contractor may be retained by City to cover both the liquidated and the actual damages described above and, should such money not be sufficient to cover such damages, City shall have the right to recover the balance from Contractor or its sureties.

## **PART 2 - PRODUCTS**

### **2.01 REFERENCE STANDARDS**

- A. For products specified by association or trade standards, comply with requirements of standard, except where more rigid requirements are specified or are required by applicable codes.

### **2.02 PRODUCTS ORDERED IN ADVANCE**

- A. As provided in Document 00 7200 (General Conditions) and Section 01 2000 (Measurement and Payment), and subject to all other provisions of the Contract Documents, City will pay for the following materials and equipment prior to incorporation into the Work: None anticipated.

### **2.03 CITY-FURNISHED PRODUCTS**

- A. City-Furnished Products:
  - 1. Wood log bench provided by City, for contractor to pick up at the location where the City is currently holding for storage, and install as described in the plans and specifications.
  - 2. Redwood stumps provided by City, for contractor to pick up at the location where the City is currently holding for storage, and install as described in the plans and specifications.
  - 3. Dishwasher provided by City for contractor to install as described in the plans and specifications.
  - 4. Wall monitor provided by City for contractor to install as described in the plans and specifications.
- B. City's Responsibilities:
  - 1. Arrange for and deliver City-reviewed Shop Drawings, Product Data, and Samples, to Contractor.
  - 2. Arrange and pay for delivery to Site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, Defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Review City-reviewed Shop Drawings, Product Data, and Samples.
2. Receive and unload products at Site; inspect for completeness or damage jointly with City.
3. Handle, store, install, and finish products.
4. Repair or replace items damaged after receipt.
5. Install into Project per Contract Documents.

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

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DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 2000**

**MEASUREMENT AND PAYMENT**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes description of requirements and procedures for determining amount of Work performed and for obtaining payment for Work performed.

**1.02 REFERENCES**

- A. California Public Contract Code
- B. Code of Civil Procedures
- C. Government Code

**1.03 COMPOSITION AND SCOPE OF CONTRACT SUM**

**A. Scope of Contract Sum**

- 1. The Contract Sum for performance of the Work under Contract Documents, or under any Bid item, allowance, or Alternate, shall include full compensation for all Work required under the Contract Documents, including without limitation, all labor, materials, taxes, transport, handling, storage, supervision, administration, and all other items necessary for the satisfactory completion of the Work, whether or not expressly specified or indicated, incidental work and unexpected expenses, and all terms, conditions, requirements and limitations set forth in the Contract Documents.
- 2. Contract Sum may be expressed as lump sum, unit price, GMP, allowance, or combination thereof.

**B. Unit Price items**

- 1. Quantity of Work to be paid for under any item for which a unit price is fixed in Contract Documents shall be determined by City based on, so far as practicable, actual number of units satisfactorily completed, as determined by City and certified by Contractor, within prescribed or ordered limits, and no payment will be made for Work unsatisfactorily performed or done outside of limits.
- 2. Unit Prices shall apply to Work covered by unit prices so long as actual quantities performed on the Project are not less than 75 percent or greater than 125 percent of the estimated quantities bid or otherwise stated in the Contract Documents. If actual quantities exceed these parameters, then the unit price shall be adjusted by an amount to reflect the Contractor's incremental cost differential resulting from increased or decreased economies of scale.

**C. Lump Sum Items**

- 1. When estimated quantity for specific portion of Work is not indicated and/or Work is designated as lump sum, payment will be on a lump sum basis for Work satisfactorily completed in accordance with Contract Documents.
- 2. Payment for lump sum Work, or items of Work subject to a lump sum (e.g. without limitation, change order work), shall be made on the basis of satisfactory completion of such Work or work item, earned in progressive stages in accordance with the Contract Documents, up to but not

exceeding the Contractor's percentage completion of the Work or item.

3. Lump sum items shall be paid based upon the approved Schedule of Values, which shall be used to measure progressive payments based upon satisfactory progress towards completion of the item.

#### **D. Allowance Items**

1. Allowances: Allowance Work will be authorized by City in writing, following change order procedures to determine cost, supporting documentation and authorization to proceed. Unused allowance amounts at Contract completion shall reduce the Contract price accordingly.

### **1.04 PAYMENT PROCEDURES**

#### **A. Schedule of Values:**

1. Within ten calendar days from issuance of Notice of Award and prior to the Contractor's first Application for Payment, Contractor shall submit a detailed breakdown of its Bid by scheduled Work items and/or activities, including coordination responsibilities and Project Record Documents responsibilities. Where more than one Subcontractor comprises the work of a Work item or activity, the Schedule of Values shall show a separate line item for each subcontract. Contractor shall furnish such breakdown of the total Contract Sum by assigning dollar values (cost estimates) to each applicable Progress Schedule network activity, which cumulative sum equals the total Contract Sum. This breakdown shall be referred to as the Schedule of Values.
2. Contractor's overhead, profit, insurance, cost of bonds (except to the extent expressly identified in a Bid item) and/or other financing, as well as "general conditions costs," (e.g., Site cleanup and maintenance, temporary roads and access, off-Site access roads, temporary power and lighting, security, and the like), shall be prorated through all activities so that the sum of all the Schedule of Values line items equals Contractor's total Contract Sum, less any allowances designated by City. Scheduling, record documents and quality assurance control shall be separate line items.
3. City will review the breakdown in conjunction with the Progress Schedule to ensure that the dollar amounts of this Schedule of Values are, in fact, reasonable cost allocations for the Work items listed. Upon favorable review by City, City will accept this Schedule of Values for use. City shall be the sole judge of fair market cost allocations.
4. City will reject any attempt to increase the cost of early activities, i.e., "front loading," resulting in a complete reallocation of moneys until such "front loading" is corrected. Repeated attempts at "front loading" may result in suspension or termination of the Work for default, or refusal to process progress payments until such time as the Schedule of Values is acceptable to City.

#### **B. Contractor's Requests for Progress Payments**

1. If requested by Contractor, progress payments will be made monthly, under the following conditions:
2. On or before the 25th Day of each month, Contractor shall submit to City five copies of an Application for Payment for the cost of the Work put in place during the period from the last Day of the previous month to the end of the current month, along with one copy of an updated Progress Schedule. Such Applications for Payment shall be for the expected total value of activities completed or partially completed, based upon Schedule of Values prices (or Bid item prices if unit price) of all labor and materials incorporated in the Work up until midnight of the last Day of that one month period, less the aggregate of previous payments. Accumulated retainage shall be shown as separate item in payment summary. City and Contractor will reconcile any differences in the field, based on the reconciled monthly report sheets. If Contractor is late submitting its Application for Payment, that Application may be processed at

any time during the succeeding one-month period, resulting in processing of Contractor's Application for Payment being delayed for more than a Day for Day basis.

3. Except as otherwise provided in a labor compliance program applicable to the Work (if any) or as otherwise required by City, concurrently with each Application for Payment, Contractor shall submit to the City the Contractor's and its Subcontractors' certified payroll records required to be maintained pursuant to Labor Code Section 1776 for all labor performed during pay periods ending during the period covered by the Application for Payment.
4. No progress payment will be processed prior to City receiving all requested, acceptable schedule update information and certified payrolls, and in City's sole and absolute discretion, City may deny the entire Application for Payment for noncompliance.
5. Each Application for Payment shall list each Change Order and Construction Change Directive ("CCD") executed prior to date of submission, including the Change Order/CCD Number, and a description of the Work activities, consistent with the descriptions of original Work activities. Contractor shall submit a monthly Change Order/CCD status log to City.
6. If City requires substantiating data, Contractor shall submit information requested by City, with cover letter identifying Project, Application for Payment number and date, and detailed list of enclosures. Contractor shall submit one copy of substantiating data and cover letter for each copy of Application for Payment submitted.
7. If Contractor fails or refuses to participate in monthly Work reconciliations or other construction progress evaluation with City, Contractor shall not receive current payment until Contractor has participated fully in providing construction progress information and schedule update information to City.

C. City's Review of Progress Payment Applications

1. City will review Contractor's Application for Payment following receipt and during the Progress Schedule and Billing Meeting. If adjustments need to be made to percent of completion of each activity, City will make appropriate notations and return to Contractor. Contractor shall revise and resubmit. All parties shall update percentage of completion values in the same manner, i.e., express value of an accumulated percentage of completion to date.
2. If City determines that portions of the Application for Payment are not proper or not due under the Contract Documents, then City may approve the other portions of the Application for Payment, and in the case of disputed items or Defective Work not remedied, may withhold up to 150 percent of the disputed amount from the progress payment.
3. Pursuant to California Public Contract Code §20104.50, if City fails to make any progress payment within 30 calendar days after receipt of an undisputed and properly submitted Application for Payment from Contractor, City shall pay interest to the Contractor equivalent to the legal rates set forth in subdivision (a) of Section 685.010 of the California Code of Civil Procedure. The 30-Day period shall be reduced by the number of calendar days by which City exceeds the seven-Day return requirement set forth herein.
4. As soon as practicable after approval of each Application for Payment for progress payments, City will pay to Contractor in manner provided by law, an amount equal to 95 percent of the amounts otherwise due as provided in the Contract Documents, or a lesser amount if so provided in Contract Documents and by law, provided that payments may at any time be withheld if, in judgment of City, Work is not proceeding in accordance with Contract, or Contractor is not complying with requirements of Contract, or to comply with stop notices or to offset liquidated damages accruing or expected. In City's sole discretion, if Contractor has failed to comply with either its Progress Schedule update or project record documents requirements, City may retain an additional 5% of any earned amounts until such requirements are satisfied.

5. Before any progress payment or final payment is due or made, Contractor shall submit satisfactory evidence that Contractor is not delinquent in payments to employees, Subcontractors, suppliers, or creditors for labor and materials incorporated into Work. This specifically includes, without limitation, conditional lien release forms for the current progress payment and unconditional release forms for past progress payments. This also includes copies of certified payroll from contractor and subcontractors for the current payment period.

D. Payment for Material and Equipment Not Yet Incorporated Into the Work

1. No payment shall be made for materials or equipment not yet incorporated into the Work, except as specified elsewhere in the Contract Documents or as may be agreed to by City in its sole discretion. Where Contractor requests payment on the basis of materials and equipment not incorporated in the Work, Contractor must satisfy the following conditions:
2. The materials and/or equipment shall be delivered and suitably stored at the Site or at another local location agreed to in writing, for example, a mutually acceptable bonded and insured warehouse.
3. Full title to the materials and/or equipment shall vest in City at the time of delivery to the Site, warehouse or other storage location. Obtain a negotiable warehouse receipt, endorsed over to City for materials and/or equipment stored in an off-site warehouse. No payment will be made until such endorsed receipts are delivered to City.
4. Stockpiled materials and/or equipment shall be available for City inspection, but City shall have no obligation to inspect them and its inspection or failure to inspect shall not relieve Contractor of any obligations under the Contract Documents. Materials and/or equipment shall be segregated and labeled or tagged to identify these specific Contract Documents.
5. After delivery of materials and/or equipment, if any inherent or acquired defects are discovered, defective materials and/or equipment shall be removed and replaced with suitable materials and/or equipment at Contractor's expense.
6. At Contractor's expense, insure the materials and/or equipment against theft, fire, flood, vandalism, and malicious mischief, as well as any other coverages required under the Contract Documents.
7. Contractor's Application for Payment shall be accompanied by a bill of sale, invoice or other documentation warranting that City has received the materials and equipment free and clear of all liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect City interest therein, all of which must be satisfactory to City. This documentation shall include, but not be limited to, conditional releases of mechanics' liens and stop notices from all those providing materials and equipment as to which the Application for Payment relates, as well as unconditional releases of the same from the same as to the previous Application for Payment for which they have not already been provided. Amounts previously paid for materials and equipment prior to incorporation into the Work shall be deducted from amounts otherwise due Contractor as they are incorporated.

### 1.05 FINAL PAYMENT

A. Final Payment

1. As soon as practicable after all required Work is completed in accordance with Contract Documents, including punchlist, testing, record documents and Contractor maintenance after Final Acceptance, Contractor shall submit its Application for Final Payment.
2. Provided Contractor has met all conditions required for Final payment, City will pay to Contractor, in manner provided by law, unpaid balance of Contract Sum of Work (including, without limitation, retentions), or whole Contract Sum of Work if no progress payment has been



made, determined in accordance with terms of Contract Documents, less sums as may be lawfully retained under any provisions of Contract Documents or by law.

**B. Final Accounting**

1. Prior progress payments and change orders shall be subject to audit and correction in the final payment.
2. Contractor and each assignee under an assignment in effect at time of final payment shall execute and deliver at time of final payment, and as a condition precedent to final payment, Document 00 6530 (Agreement and Release of Claims).

**1.06 SUBSTITUTION OF SECURITIES**

- A. Public Contract Code Section 22300.** In accordance with the provisions of Public Contract Code Section 22300, substitution of securities for any moneys withheld under Contract Documents to ensure performance is permitted under following conditions:
1. At request and expense of Contractor, securities listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by Contractor and City which are equivalent to the amount withheld under retention provisions of Contract shall be deposited with Controller or with a state or federally chartered bank in California, as the escrow agent, who shall then pay such moneys to Contractor. Upon satisfactory completion of Contract, securities shall be returned to Contractor.
  2. Alternatively, Contractor may request and City shall make payment of retentions earned directly to the escrow agent at the expense of Contractor. At the expense of Contractor, Contractor may direct the investment of the payments into securities and receive the interest earned on the investments upon the same terms provided for securities deposited by Contractor. Upon satisfactory completion of the work of the Contract Documents, Contractor shall receive from escrow agent all securities, interest, and payments received by the escrow agent from City. Contractor shall then pay to each Subcontractor, not later than 10 calendar days after receipt of the payment, the respective amount of interest earned, net of costs attributed to retention withheld from each Subcontractor, on the amount of retention withheld to insure the performance of Contractor.
  3. Contractor shall be beneficial owner of securities substituted for moneys withheld and shall receive any interest thereon.
  4. Contractor may enter into an escrow agreement, form included in Contract Documents, as authorized under Public Contract Code Section 22300, specifying amount of securities to be deposited, terms and conditions of conversion to cash in case of default of Contractor, and termination of escrow upon completion of Contract Documents.
  5. Public Contract Code Section 22300, in effect on Bid Day, is hereby incorporated in full by this reference and shall supersede anything inconsistent therewith.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**



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## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 2600

## MODIFICATION PROCEDURES

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section includes requirements that supplement the paragraphs of Document 00 7200 (General Conditions).
- B. Description of procedures for modifying the Contract Documents and determining costs for changes in contract amounts.

## 1.02 PROCEDURES FOR CONTRACTOR INITIATED CHANGE ORDER

- A. Contractor-Initiated Change Proposal Request (CPR) and Procedures:
  - 1. Contractor may initiate changes by submitting a Change Proposal Request ("CPR").
  - 2. Whenever Contractor elects or is entitled to submit a CPR, Contractor shall prepare and submit to City for consideration a CPR using the form included in this Project Manual. All CPRs must contain a complete breakdown of costs of credits, deducts and extras; itemizing materials, labor, taxes, Markup and any requested changes to Contract Time. All Subcontractor Work shall be so indicated. Individual entries on the CPR form shall include applicable Schedule of Values code, with all amounts determined as provided herein. After receipt of a CPR with a detailed breakdown, City will act promptly thereon.
  - 3. If City accepts a CPR, City will prepare a Change Order for City and Contractor signatures.
  - 4. If CPR is not acceptable to City because it does not agree with Contractor's proposed cost and/or time, City will provide comments thereto. Contractor will then, within seven (7) calendar days (except as otherwise provided herein), submit a revised CPR.
  - 5. When necessity to proceed with a change does not allow City sufficient time to conduct a proper check of a CPR (or revised CPR), City may issue a Change Directive (CD) as provided below.
- B. Contractor-Initiated Request for Information (RFI) Procedures, Requirements and Limitations:
  - 1. Contractor may submit RFI's for clarifications in City-prepared Contract Documents, which may result in the Contractor submitting a CPR.
  - 2. Whenever Contractor requires information regarding the Project or City-prepared Contract Documents, or receives a request for such information from a Subcontractor, Contractor may prepare and deliver an RFI to City. Contractor shall use RFI format provided on approval by City. Contractor shall not issue an RFI to City solely to clarify Contractor-prepared Construction Documents. Contractor must submit time critical RFIs at least 30 calendar days before scheduled start date of the affected Work activity. Contractor shall reference each RFI to an activity of Progress Schedule and shall note time criticality of the RFI, indicating time within which a response is required. Contractor's failure to reference RFI to an activity on the Progress Schedule and note time criticality on the RFI shall constitute Contractor's waiver of any claim for time delay or interruption to the Work resulting from any delay in responding to the RFI.
  - 3. Contractor shall be responsible for its costs to implement and administer RFIs throughout the Contract duration. Regardless of the number of RFIs submitted, Contractor shall not be entitled

to additional compensation for the effort required to submit the RFIs. Contractor shall be responsible for City's administrative costs for answering RFIs where the answer could reasonably be found by reviewing the Contract Documents, as determined by City; at City discretion, such costs may be deducted from progress payments or final payment.

4. City will respond within ten (10) calendar days from receipt of RFI with a written response to Contractor. Contractor shall distribute response to all appropriate Subcontractors.
5. If Contractor is satisfied with the response and does not request a change in Contract Sum or Contract Time, then the response shall be executed without a change.
6. If Contractor believes the response is incomplete, Contractor shall issue another RFI (with the same RFI number with the letter "A" indicating it is a follow-up RFI) to City clarifying original RFI. Additionally, City may return RFI requesting additional information should original RFI be inadequate in describing condition.

C. Time Requirements:

1. If Contractor believes that a City response to an RFI, submittal or other City direction, results in change in Contract Sum or Contract Time, Contractor shall notify City with the issuance of a preliminary CPR within ten calendar days after receiving City's response or direction, and in no event after starting the disputed work or later than the time allowed under Article 12 of Document 00 7200 (General Conditions). If Contractor also requests a time extension, or has issued a notice of delay or otherwise requests a time extension with a CPR, then Contractor shall submit a Time Impact Evaluation (TIE) required herein concurrently with the CPR and in no event later than ten calendar days after providing the notice of delay.
2. If Contractor requires more time to accurately identify the required changes to the Contract Sum or Contract Time, Contractor may submit an updated and final CPR and TIE within 14 calendar days of submitting the preliminary CPR.
3. If City agrees with Contractor's CPR and/or TIE, then City will prepare a Change Order for City and Contractor signatures. If City disagrees with Contractor, then Contractor may give notice of potential claim as provided in Article 12 of Document 00 7200 (General Conditions), and proceed thereunder.
4. Contractor must submit CPRs, notices of potential claim or Claims within the required time periods. Any failure to do so waives Contractor's right to submit a CPR or file a Claim.

D. Cost Estimate Information:

1. Contractor and subcontractors shall, upon City's request, permit inspection of the original unaltered cost estimates, subcontract agreements, purchase orders relating to the change, and documents substantiating all costs associated with its CPR or Claims arising from changes in the Work.

### **1.03 PROCEDURES FOR CITY INITIATED CHANGE ORDERS**

A. City Initiated Change Directives (CD):

1. City may, by Change Directive ("CD") or initially by Instruction Bulletin or by following the procedures for disputed work herein, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, with or without adjustment to Contract Sum or Contract Time.
2. If at any time City believes in good faith that a timely Change Order will not be agreed upon using the foregoing procedures, or at any other time, City may issue a CD with its recommended cost and/or time adjustment (if any). Upon receipt of CD, Contractor shall promptly proceed with the change of Work involved and respond to City within ten (10) calendar days.
3. Contractor's response must be any one of following:

- a. Return CD signed, thereby accepting City response, including adjustment to time and cost (if any).
  - b. Submit a (revised if applicable) Cost Proposal with supporting documentation (if applicable, reference original Cost Proposal number followed by letter A, B, etc. for each revision), if City so requests.
  - c. Give notice of intent to submit a claim as described in Article 12 of Document 00 7200 (General Conditions), and submit its claim as provided therein.
4. If CPR or the CD provides for an adjustment to any Contract Sum, the adjustment shall be based on one of the following methods:
- a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
  - b. Contractor to proceed on cost reimbursable (force account) basis while negotiating towards a firm price.
  - c. Cost to be determined in a manner agreed.
5. Change Directive signed by Contractor indicates the agreement of Contractor therewith, including adjustment in Contract Sum or the method for determining them. Such agreement shall be effective immediately and shall be finalized as a Change Order. Where City authorizes CD work on a time and materials basis up to a maximum amount, then Contractor shall promptly advise City upon reaching 75% of such maximum amount, otherwise Contractor shall accept fully the risk of completing the CD work without exceeding such maximum amount.
6. If Contractor does not respond promptly or disagrees with the method for adjustment (or non-adjustment) in the Contract Sum, the method and the adjustment shall be determined by City on the basis of the Contract Documents and the reasonable expenditures and savings of those performing the Work attributable to the change. If the parties still do not agree on the proper adjustment due to a Change Directive, Contractor may file a Claim per Article 12 of Document 00 7200 (General Conditions) and/or City may direct the changed work through a unilateral change order. Contractor shall keep and present an itemized accounting in a manner consistent with the SOV, together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this paragraph shall be limited to those provided herein.
7. Pending final determination of cost to City, Contractor may include amounts not in dispute in its Applications for Payment. The amount of credit to be allowed by Contractor to City for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by City. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for Markup shall be figured on the basis of net increase, if any, with respect to that change.
- B. City Initiated Change Order (CO) or Request for Proposal (RFP):
1. City may initiate changes in the Work or Contract Time by issuing a Request for Proposal ("RFP") or Change Order ("CO") to Contractor.
  2. City may issue an RFP to Contractor. Any RFP will detail all proposed changes in the Work and request a quotation of changes in Contract Sum and Contract Time from Contractor.
  3. In response to an RFP, Contractor shall furnish a Change Proposal Request (CPR) within twenty-one (21) Business Days of City's RFP. Upon approval of CPR, City may issue a Change Directive directing Contractor to proceed with extra Work.
  4. If the parties agree on price and time for the work, the City will issue a Contact Change Order. If the parties do not agree on the price or time for a CPR, City may either issue a CD or decide the issue per Article 12 of Document 00 7200 (General Conditions). Contractor shall perform the changed Work notwithstanding any claims or disagreements of any nature.

#### **1.04 PROCEDURES THAT APPLY TO CONTRACTOR- AND CITY-INITIATED CHANGE ORDERS**

- A. Adjustment of Schedules to Reflect Change Orders or CDs:
1. Contractor shall revise Schedule of Values and Application for Payment forms to record each authorized Change Order or CD as a separate line item and adjust the Contract Sum as shown thereon prior to the next monthly pay period.
  2. Contractor shall revise the Progress Schedules prior to the next monthly pay period, to reflect CO or CD.
  3. Contractor shall enter changes in Project Record Documents prior to the next monthly pay period.
- B. Required Documentation for Adjustments to Contract Amounts:
1. For all changes and cost adjustments requested, Contractor shall provide documentation of change in Contract Amounts asserted, with sufficient data to allow evaluation of the proposal.
  2. In all requests for compensation, cost proposals, estimates, claims and any other calculation of costs made under the Contract Documents, Contractor shall breakout and quantify costs of labor, equipment and materials identified herein, for Contractor and subcontractors of any tier.
  3. Contractor shall, on request, provide additional data to support computations for:
    - a. Quantities of products, materials, labor and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Justification for any change in Contract Time and new Progress Schedule showing revision due, if any.
    - d. Credit for deletions from Contract, similarly documented.
  4. Contractor shall support each claim or computation for additional cost, with additional information including:
    - a. Origin and date of claim or request for additional compensation.
    - b. Dates and times Work was performed and by whom.
    - c. Time records and wage rates paid.
    - d. Invoices and receipts for products, materials, equipment and subcontracts, similarly documented.
    - e. Credit for deletions from Contract, similarly documented.
- C. Responses and Disputes:
1. For all responses for which the Contract Documents do not provide a specific time period, recipients shall respond within a reasonable time.
  2. For all disputes arising from the procedures herein, Contractor shall follow Article 12 of Document 00 7200 (General Conditions).

#### **1.05 COST DETERMINATION FOR CHANGES IN CONTRACT AMOUNTS**

- A. Calculation of Total Cost of Extra Work:
1. Total cost of changed Work, extra Work or of Work omitted shall be the sum of three components defined immediately below as: Component 1 (Direct Cost(s)); Component 2 (Markup); and, Component 3 (bonds, insurance, taxes)
  2. Component 1: Direct Cost(s) of labor, equipment and materials, is calculated based upon actually incurred (or omitted) labor costs, material costs and equipment rental costs, as defined herein;
  3. Component 2: Markup on such actually incurred Direct Costs, is applied in the percentages identified below; and
  4. Component 3: Actual additional costs for any additionally required insurance, bonds, and/or taxes, defined herein, is calculated without Markup.

**1.06 MEASUREMENT OF DIRECT COST OF CONSTRUCTION (COST COMPONENT NO. 1)****A. Composition of Component 1 (Direct Cost of Construction):**

1. Component 1 has four subcomponents, also referred to as "LEMS":
  - a. Labor (Component 1A)
  - b. Equipment (Component 1B)
  - c. Materials (Component 1C)
  - d. Subcontractors (Component 1D)

**B. Measurement of Cost of Labor (Component 1A):**

1. Cost of Labor shall be calculated as: Cost of labor for workers (including forepersons when authorized by City) used in actual and direct performance of the subject work, whether employer is Contractor, Subcontractor or other forces, in the sum of the following:
  - a. Actual Wages: Actual wages paid shall include any employer payments to or on behalf of workers for health and welfare, pension, vacation, and similar purposes.
  - b. Labor surcharge: Payments imposed by local, county, state, and federal laws and ordinances, and other payments made to, or on behalf of, workers, other than actual wages as defined, such as worker's compensation insurance. Such labor surcharge shall not exceed generally accepted standards in the State for labor rates in effect on date upon which extra Work is accomplished.
  - c. Cost of labor shall include no other costs, fees or charges.
2. Labor cost for operators of equipment owned and operated by Contractor or any Subcontractor, shall be no more than rates of such labor established by collective bargaining agreements for type of worker and location of Work, whether or not owner-operator (i.e., Contractor or Subcontractor) is actually covered by such an agreement.
3. Cost of labor shall be recorded and documented in certified payroll records, maintained in the form customary and/or required in the State, delivered to City weekly.

**C. Measurement of Cost of Equipment (Component 1B):**

1. Measurement of Component 1B (Cost of Equipment). Cost of Equipment shall be calculated as: Cost of Equipment used in actual and direct performance of the subject work, whether by Contractor, Subcontractor or other forces. Cost of Equipment shall be calculated as herein described.
2. For rented equipment, cost will be based on actual rental invoices, appropriate for the use and duration of the work. Equipment used on extra Work shall be of proper size and type. If, however, equipment of unwarranted size or type and cost is used, cost of use of equipment shall be calculated at rental rate for equipment of proper size and type, as determined by City.
3. Equipment rental cost for Contractor or Subcontractor-owned equipment, shall be determined by reference to, and not in excess of, the generally accepted standards in the State for equipment rental rates in effect on date upon which extra Work is accomplished. If there is no applicable rate for an item of equipment, then payment shall be made for Contractor- or Subcontractor-owned equipment at rental rate listed in the most recent edition of the CalTrans Standard Schedules and Specifications, and absent a rental rate therein, then the Association of Equipment Distributors (AED) book.
4. In all cases, rental rates paid shall be deemed to cover cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.
5. Unless otherwise specified, manufacturer's ratings, and manufacturer-approved modifications, shall be used to classify equipment for determination of applicable rental rates. Individual pieces of equipment or tools not listed in said publication and having a replacement value of \$100 or less, whether or not consumed by use, shall be considered to be small tools and no



payment will be made therefore as payment is included in payment for labor. Rental time will not be allowed while equipment is inoperative due to breakdowns.

6. For equipment on Site, rental time to be paid for equipment shall be time equipment is in operation on extra Work being performed or on standby as approved by City. The following shall be used in computing rental time of equipment:
    - a. When hourly rates are listed, less than 30 minutes of operation shall be considered to be ½ hour of operation.
    - b. When daily rates are listed, less than four hours of operation shall be considered to be ½ Day of operation.
    - c. Rates shall correspond to actual rates paid by Contractor, i.e., if Contractor pays lower weekly or monthly rates, then same shall be charged to City.
  7. For equipment that must be brought to Site to be used exclusively on extra Work, cost of transporting equipment to Site and its return to its original location shall be determined as follows:
    - a. City will pay for costs of loading and unloading equipment.
    - b. Cost of transporting equipment in low bed trailers shall not exceed hourly rates charged by established haulers.
    - c. Cost of transporting equipment shall not exceed applicable minimum established rates of California Public Utilities Commission or appropriate State Dept. of Transportation.
    - d. City will not make any payment for transporting and loading and unloading equipment if equipment is used on Work in any other way than upon extra Work.
    - e. Rental period may begin at time equipment is unloaded at Site of extra Work and terminate at end of the performance of the extra Work or Day on which City directs Contractor to discontinue use of equipment, whichever first occurs. Excluding Saturdays, Sundays, and City legal holidays, unless equipment is used to perform extra Work on such Days, rental time to be paid per Day shall be four hours for zero hours of operation, six hours for four hours of operation and eight hours for eight hours of operation, time being prorated between these parameters. Hours to be paid for equipment that is operated less than eight hours due to breakdowns, shall not exceed eight less number of hours equipment is inoperative due to breakdowns.
  8. Employee vehicles are not part of Component 1A, rather, are included within Component 2 (Markup).
  9. Equipment costs shall include no other costs, fees or charges.
- D. Measurement of Cost of Material (Component 1C):
1. Cost of Material shall be calculated as herein described. Cost of such materials will be cost to purchaser (Contractor, Subcontractor or other forces) from supplier thereof, except as the following are applicable:
  2. If cash or trade discount by actual supplier is offered or available to purchaser, it shall be credited to City notwithstanding fact that such discount may not have been taken.
  3. For materials salvaged upon completion of Work, salvage value of materials shall be deducted from cost, less discounts, of materials.
  4. If cost of a material is, in opinion of City, excessive, then cost of material shall be deemed to be lowest current wholesale price at which material is available in quantities concerned delivered to Site, less any discounts as provided in this Paragraph.
  5. Material costs shall include no other costs, fees or charges.
- E. Measurement of Cost of Subcontractors (Component 1D):
1. Where reimbursed or calculated per the terms of the Contract Documents, change order or Change Directive, cost of Subcontractors shall be calculated as amounts earned by

Subcontractors procured in compliance with the Contract Documents and approved by the City, provided such subcontractor earned amounts meet the following requirements:

- a. Such amounts are earned under the terms of the Subcontracts and the Work complies with the terms of the Contract Documents;
- b. Such amounts are properly requested, documented and permitted under the terms of the subcontract(s) and the Contract Documents.
- c. Total cost to City of Direct Costs of Construction (labor, equipment, materials), Markup, and costs of bonds, insurance and taxes, conform to contract limitations (i.e., totals paid by City do not exceed the 20% Markup limitation.).

#### **1.07 MEASUREMENT AND PAYMENT OF MARK UP (COST COMPONENT 2)**

##### **A. Markup Percentages for Changed Work (Component 2):**

1. Markup on Direct Cost of labor and materials for extra Work shall be 15%. Markup on Direct Cost of equipment for extra Work shall be 15%.
2. When extra Work is performed by Subcontractors, regardless of the number of tiers, total Markup on "Component 1" Direct Costs shall not exceed 20%. Contractor and its Subcontractors shall divide the 20% as they may agree.
3. Under no circumstances shall the total Markup on any extra Work exceed twenty (20) percent, stated as a percent of the Direct Cost of labor, equipment and materials. This limitation shall apply regardless of the actual number of subcontract tiers.
4. On proposals covering both increases and decreases in Contract Sum, Markup shall be allowed on the net increase only as determined above. When the net difference is a deletion, no percentage for Markup shall be allowed, but rather an appropriate percentage deduction shall be issued in the amount of the net difference.

##### **B. Measurement and Payment of Mark Up (Component 2):**

1. Mark Up (Component 2) provides complete compensation to Contractor for:
  - a. All Contractor profit;
  - b. All Contractor home-office overhead;
  - c. All Contractor assumption of risk assigned to Contractor under the Contract Documents;
  - d. Subject to the qualifications below regarding self-performed work, all General Conditions and General Requirements.
2. Profit. Compensation for profit included within Component 2 (Mark Up), includes without limitation: Fees of all types, nature and description; and Profit and margins of all types, nature and description.
3. Home Office Expenses. Compensation for home office expenses included within Component 2 (Mark Up), includes without limitation: Salaries and other compensation of any type of Contractor's personnel (management, administrative and clerical), and all direct and indirect operating, travel, payroll, safety, storage, quality control, maintenance and overhead costs of any nature whatsoever, incurred by Contractor at any location other than the Project specific site office, including without limitation, Contractor's principal or branch offices; insurance premiums other than those for Project specific insurance directed by the City in a change order; all hardware, software, supplies and support personnel necessary or convenient for Contractor's capture, documentation and maintenance of its costs and cost accounting data and cost accounting and control systems and work progress reporting.
4. Assumption of Risk. Compensation for Contractor's assumption of risk under the Contract Documents, included within Component 2 (Mark Up), includes without limitation loss, cost, damage, expense or liability resulting directly or indirectly from any of the following causes ("unallowable costs"), for Contractor and subcontractors of any tier: noncompliance with the Contract Documents, fault or negligence, defective or non-conforming Work, by Contractor or any Subcontractor or Vendor of any tier or anyone directly or indirectly employed by any of

them, or for whose acts or omissions any of them are responsible or liable at law or under the Contract Documents; cost overruns of any type; costs in excess of any lump sum, not to exceed amount or GMP; costs resulting from bid or "buy out" errors, unallocated scope, or incomplete transfer of scope or contract terms to subcontractors; any costs incurred by Contractor relating to a Change in the Work without a Change Order or Change Directive in accordance with the Contract Documents; costs for work or materials for which no price is fixed in the Contract Documents, unless it is expressly specified that such work or material is to be paid for as extra work.

5. General Conditions and Division 1 General Requirements. Compensation for Contractor's General Conditions and General Requirements Costs included within Component 2 (Mark Up), includes compensation to Contractor for: Contractor's direct costs, without overhead or profit, for salaries and related forms of compensation and employer's costs for labor and personnel costs, of Contractor's employees and subconsultant's employees (if any), while and only to the extent they are performing Work at the Project Site. Personnel and Work compensated by this Component include without limitation: All required Project management responsibilities; all on-site services; monthly reporting and scheduling; routine field inspection of Work; general superintendence; general administration and preparation of cost proposals, schedule analysis, change orders and other supporting documentation as necessary; salaries of project superintendent, project engineers, project managers, safety manager, other manager, timekeeper, and secretaries; all cost estimates and updates thereto; development, validation and updates to the project schedule; surveying; estimating. Compensation for Contractor's General Requirements Costs included within Component 2 (Mark Up), compensates Contractor for its "General Requirements" Costs, including without limitation: all scheduling hardware, software, licenses, equipment, materials and supplies; purchase, lease or rental, build out, procurement, supporting equipment and maintenance of temporary on-Site facilities, Project field and office trailers and other temporary facilities, office equipment and supporting utilities; platforms, fencing, cleanup and jobsite security; temporary roads, parking areas, temporary security or safety fencing and barricades, etc.; all Contractor's motor vehicles used by any Contractor's personnel, and all costs thereof; all health and safety requirements, required by law or City procedures; all surveying; all protection of Work; handling and disposal fees; final cleanup; repair or maintenance; other incidental Work; all items, activities and function similar to any of those described above; all travel, entertainment, lodging, board and the like.
6. Personnel compensated by the Markup Component do not include workers of foreman level or below in the case of self-performed work; rather, such personnel shall be treated as a Direct Cost of Construction. Costs compensated by the Markup component do not include temporary measures specifically required by the changed work, not otherwise required or ongoing in the prosecution of the Work, that commence specifically to support the changed work and conclude with the completion of the changed work. Such costs shall be treated as Direct Costs of Construction. Examples of General Requirements costs that this component may not cover are the following: temporary barricades or fencing of specific areas required specifically for the changed work; cranes required specifically for the changed work; extra security required specifically for the changed work.

#### **1.08 MEASUREMENT AND PAYMENT OF BONDS INSURANCE TAXES (COMPONENT 3)**

##### **A. Measurement of Bonds, Insurance, Taxes (Component 3):**

1. Component 3 (Bonds, Insurance, Taxes) consists of the cost of bonds, insurance and taxes, also referred to as "BIT". All State sales and use taxes, applicable County and applicable City sales taxes, shall be included. Federal and Excise tax shall not be included.
2. There is no mark up on BIT.

#### **1.09 EFFECT OF PAYMENT**

##### **A. Change Order Compensation is All Inclusive.**

1. Except as provided expressly below regarding changes that extend the Contract Time, payment

of calculated cost of extra work constitutes full and complete compensation for costs or expense arising from the extra Work, and is intended to be all inclusive.

2. Payment for Direct Cost of Construction (Component 1 or LEMS) is intended to be all-inclusive. Any costs or risks not delineated within cost of labor, equipment or materials herein, shall be deemed to be within the costs and risks encompassed by the applicable Markups and unallowable in any separate amount.
  3. Payment of Markup (Component 2) is intended to be all-inclusive. Contractor waives claims for any further or different payment of cost and risk items delineated herein, other than the allowable percentage markup on costs set forth in the Contract Documents; such separate, further or different cost or risk items shall be unallowable, waived and liquidated within the allowable percentage markup.
  4. Contractor shall recover no other costs or markups on extra work of any type, nature or description.
- B. Exception for Changes Extending the Contract Time.
1. Where a change in the Work extends the Contract Time, Contractor may request and recover additional, actual direct costs, provided Contractor can demonstrate such additional costs are (i.) actually incurred performing the Work, (ii.) not compensated by the Markup allowed, and (iii) directly result from the extended Contract Time. Contractor shall make such request and provide such documentation following all required procedures, documentation and time requirements in the Contract Documents, and subject to all contract limitations of liability. Contractor may not seek or recover such costs using formulas (e.g., Eichleay).
- C. Limits of Liability / Accord and Satisfaction.
1. The foregoing limits of compensation apply in all cases of claims for changed Work, whether calculating Change Proposal Requests, Change Orders or CDs, or calculating claims and/or damages of all types, and applies even in the event of fault, negligence, strict liability, or tort claims of all kinds, including strict liability or negligence. Contractor may recover no other costs arising out of or connected with the performance of extra Work, of any nature.
  2. Under no circumstances may Contractor claim or recover special, incidental or consequential damages against City, its representatives or agents, whether arising from breach of contract, negligence, strict liability or other tort or legal theory, unless specifically and expressly authorized in the Contract Documents.
  3. No change in Work shall be considered a waiver of any other condition of Contract Documents. No claim shall be made for anticipated profit, for loss of profit, for damages, or for extra payment whatever, except as expressly provided for in Contract Documents.
  4. Accord and Satisfaction: Every Change Order and accepted CD shall constitute a full accord and satisfaction, and release, of all Contractor (and if applicable, Subcontractor) claims for additional time, money or other relief arising from or relating to the subject matter of the change including, without limitation, impacts of all types, cumulative impacts, inefficiency, overtime, delay and any other type of claim. Contractor may elect to reserve its rights to disputed claims arising from or relating to the changed Work at the time it signs a Change Order or approves a CD, but must do so expressly in a writing delivered concurrently with the executed Change Order or approved CD, and must also submit a Claim for the reserved disputed items pursuant to Article 12 of Document 00 7200 (General Conditions) no later than thirty (30) calendar days after Contractor's first written notice of its intent to reserve rights. Execution of any Change Order or CD shall constitute Contractor's representation of its agreement with this provision.

#### **1.10 MISCELLANEOUS REQUIREMENTS**

- A. City-Furnished Materials.
1. City reserves right to furnish materials as it deems advisable, and Contractor shall have no claims for costs and Markup on such materials.

B. Records And Certification.

1. All charges shall be recorded daily and summarized in Change Proposal Request form attached hereto. Contractor or authorized representative shall complete and sign form each day. Contractor shall also provide with the form: the names and classifications of workers and hours worked by each; an itemization of all materials used; and a list by size type and identification number of equipment and hours operated.
2. City shall have the right to audit all records in possession of Contractor relating to activities covered by Contractor's claims for modification of Contract, including CD Work. This right shall be specifically enforceable, and any failure of Contractor to voluntarily comply shall be deemed an irrevocable waiver and release of all claims then pending that were or could have been subject to Article 12 of Document 00 7200 (General Conditions).

C.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

[COST PROPOSAL FORM FOLLOWS ON NEXT PAGE]

**COST PROPOSAL (CP)**

Owner **Willard Park Clubhouse & Restroom Replacement**  
 Contract Number \_\_\_\_\_

CP Number: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 In Response To \_\_\_\_\_  
 RFP #, etc.

**To: City of Berkeley**  
 Attention: **Stacey Rutherford**  
**1947 Center Street, 5<sup>th</sup> Floor**  
**Berkeley, CA 94704**  
 Phone: (510) 981-6400  
 Fax: (510) 981-6390

**From: [Insert Contractor's Name/Address]** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

This Cost Proposal is in response to the above-referenced \_\_\_\_\_ **[insert RFP, etc. as applicable]**.  
 Brief description of change(s): \_\_\_\_\_  
 \_\_\_\_\_

ITEM DESCRIPTION	PRIME CONTRACTOR	SUB 1	SUB 2	SUB 3	SUB 4	TOTAL
<b>MATERIAL</b>						
<b>LABOR</b>						
<b>EQUIPMENT</b>						
Other (Specify) Extended Overhead						
<b>TOTAL COST</b>						
Subcontractor's Overhead & Profit 15 percent						
Contractor's Overhead & Profit 15 percent						
Overhead & Profit to Contractor for Subcontractor's Work 5 percent						
(percent of Total Cost above not including any Overhead & Profit – may not exceed 20%)						
<b>GRAND TOTAL</b>						
<b>REQUESTED CHANGE IN CONTRACT TIME (CALENDAR DAYS)</b>						
(Time Impact Evaluation Enclosed)						

By Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 3119**

**PROJECT MEETINGS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

A. Summary

1. Section includes description of required project meetings.

**1.02 PRECONSTRUCTION CONFERENCE**

- A. Preconstruction Conference. City will call for and administer Preconstruction Conference at time and place to be announced (usually the week prior to start of Work at the Site). Contractor, all major Subcontractors, and major suppliers shall attend Preconstruction Conference. Agenda may include, but not be limited to, the following items:

1. Schedules
2. Personnel and vehicle permit procedures
3. Use of premises
4. Location of the Contractor's on-Site facilities & Temporary Utilities
5. Security
6. Housekeeping
7. Submittal and RFI procedures
8. Inspection and testing procedures, on-Site and off-Site
9. Utility shutdown procedures
10. Control and reference point survey procedures
11. Injury and Illness Prevention Program
12. Contractor's Initial Progress Schedule
13. Contractor's Schedule of Values
14. Contractor's Schedule of Submittals
15. Jurisdictional agency requirements
16. Project Communication Procedures
17. Modification Procedures
18. Site Access by City and Consultants
19. As-Built/Record Documents
20. Permits & Fees
21. Coordination: (Work Performed for City under separate contract). (As Appropriate)
22. City will distribute copies of minutes to attendees. Attendees shall have 7 calendar days to submit comments or additions to minutes. Minutes will constitute final memorialization of results of Preconstruction Conference.

**1.03 WEEKLY PROJECT MEETINGS**

- A. City will schedule and administer weekly progress meetings throughout duration of Work. Progress meetings will be held weekly unless otherwise directed by City. Meetings shall be held at City's Offices unless otherwise specified in Contract Documents.
1. City's Representative will prepare agenda and distribute it 4 calendar days in advance of meeting to Contractor.
  2. Participants with agenda items shall present them.
  3. The Architect/Engineer and other responsible entities shall attend meetings unless otherwise



specified in Contract Documents or provided by City.

4. City shall record and distribute the meeting minutes. Minutes shall be distributed by the City to the Contractor within 3 business days after the meeting. Contractor shall distribute the minutes to those affected by decisions made at meeting. Attendees shall have five business days to submit comments or additions to the minutes. Minutes shall constitute final memorialization of results of meeting.
5. Progress meetings shall be attended by Contractor's job superintendent, major Subcontractors and suppliers, City, and others as appropriate to agenda topics for each meeting.
6. Agenda may contain the following items, as appropriate:
  - a. Review, revise as necessary, and approve previous meeting minutes
  - b. Review of Work progress since last meeting
  - c. Status of Construction Work Schedule, delivery schedules, adjustments
  - d. Submittal, RFI, and Change Order status
  - e. Review of the Contractor's safety program activities and results, including report on all serious injury and/or damage accidents
  - f. Other items affecting progress of Work

#### **1.04 PROGRESS SCHEDULE AND BILLING MEETINGS**

- A. A meeting will be held on approximately the 20th of each month to review the schedule update submittal and progress payment application.
- B. At this meeting, at a minimum, the following items will be reviewed:
  1. Percent complete of each activity;
  2. Time impact evaluations for Change Orders and Time Extension Request;
  3. Actual and anticipated activity sequence changes;
  4. Actual and anticipated duration changes; and
  5. Actual and anticipated Contractor delays.
  6. Waste Management Tracking/Tags
  7. As-Built/Record Documents
- C. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, Contractor's General Superintendent and Scheduler shall attend these meetings.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

**DIVISION 1 GENERAL REQUIREMENTS****SECTION 01 3230****PROGRESS SCHEDULES AND SUBMITTALS****PART 1 - GENERAL****1.01 SUMMARY**

- A. Section includes description of requirements and procedures for submitting progress schedules and submittals.

**1.02 CONTRACTOR TO SUBMIT PROGRESS SCHEDULES**

- A. Contractor shall submit original (baseline) progress schedule two weeks prior to the first Application for Payment.
- B. Baseline Progress Schedule shall show Contractor's construction and procurement activities, including but not limited to, equipment procurement and delivery (Contractor and City supplied), activities with Subcontractors and suppliers, major submittal reviews, commissioning of systems, use of major equipment on site, and necessary interface with City and third parties required to complete the Work in a timely manner and in accordance with Contract Time.

**1.03 SCHEDULE REQUIREMENTS.**

- A. Unless City agrees in writing otherwise, progress schedule shall be on Microsoft Project, Primavera P6, Suretrack, or equivalent software, as City may specify, which Contractor shall prepare and supply to City, with all datapoint entries completed for start dates, necessary work activities, durations (not longer than 21 calendar days) and logic ties.
- B. Contractor's progress schedule may be in the form of a CPM (arrow) diagram or, if City agrees in writing, a bar chart or a Gantt chart. The hard copies of the schedule supplied to City shall indicate the critical path of the Work (in red) and shall show a logical progression of the Work through completion within Contract Time.
- C. Unless City agrees in writing otherwise, progress schedule shall also show early and late start and finish dates and total available float (float to the successor activity's late start date) for each activity. City has no obligation to accept an early completion schedule.

**1.04 MONTHLY UPDATES**

- A. Contractor's progress schedule shall be updated monthly to reflect actual progress. The schedule shall be subject to City's review and acceptance for use in monitoring Contractor's Work and evaluating Applications for Payment.
- B. Contractor shall supply City with an electronic copy of the updated progress schedule with each monthly payment application. Contractor shall provide City with **three-week** look ahead schedules weekly, showing in detail and activities and resources scheduled for the immediate two week period.

**1.05 RECOVERY SCHEDULE**

- A. City may request a recovery schedule should Contractor fall 21 or more calendar days behind any schedule Milestone, which schedule shall show Contractor's plan and resources committed to retain Contract completion dates.
- B. The recovery schedule shall show the intended critical path. If City requests, Contractor shall also:
  - 1. Secure and demonstrate appropriate Subcontractor and supplier consent to the recovery

Schedule.

2. Submit a narrative explaining trade flow and construction flow changes and man-hour loading assumptions for major Work activities and/or Subcontractors.

**1.06 TIME IMPACT EVALUATION (“TIE”) FOR CHANGE ORDERS, TIME EXTENSIONS AND DELAYS:**

- A. When Contractor requests a time extension for any reason, Contractor shall submit a TIE that includes both a written narrative and a schedule diagram depicting how the changed Work or other impact affects other schedule activities. The schedule diagram shall show how Contractor proposes to incorporate the changed Work or other impact in the schedule and how it impacts the current Schedule update critical path or otherwise. Contractor is also responsible for requesting time extensions based on the TIE’s impact on the critical path. The diagram shall be tied to the main sequence of scheduled activities to enable City to evaluate the impact of changed Work to the scheduled critical path.
  
- B. Contractor is responsible for all costs associated with the preparation of TIE’s, and the process of incorporating TIE’s into the current schedule update. Provide City with four copies of each TIE.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

**DIVISION 1 GENERAL REQUIREMENTS****SECTION 01 3300****SUBMITTALS****PART 1 - GENERAL****1.01 SUMMARY**

- A. Section includes description of requirements and procedures for submittals.

**1.02 SCHEDULE OF SUBMITTALS**

- A. Contractor shall prepare for City's review and acceptance prior to commencement of work on the Site, for purposes of contract administration, a schedule of submittals (also referred to as a submittal register) required to complete the Work, prepared by Contractor and accepted by City for contract administration. Schedule of submittals shall include, for each submittal: the specification or drawing reference requiring the submittal, if applicable; the material, item, or process for which the submittal is required; the submittal number and identifying title of the submittal; the Contractor's anticipated submission date and the approval need date.
- B. Contractor shall update monthly the schedule of submittals to reflect actual submission and acceptance dates for submittals. Review by City of schedule of submittals does not excuse Contractor of obligation to supply, schedule and coordinate all submittals required by the Contract Documents.

**1.03 CONTRACTOR TO SUBMIT SHOP DRAWINGS, PRODUCT DATA AND SUBMITTALS.**

- A. Contractor shall review for compliance with Contract Documents, approve and submit to City Shop Drawings, Product Data, Samples and similar submittals required by Contract Documents.
- B. Contractor shall schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Contractor shall include certifications to be submitted with the pertinent drawings at the same time.
- C. Contractor shall coordinate scheduling, sequencing, preparing and processing of all submittals with performance of work so that work will not be delayed by submittal processing.
- D. Submittals shall specifically identify any Work depicted that does not conform to the Contract Documents.

**1.04 CITY REVIEW OF SHOP DRAWINGS, PRODUCT DATA AND SUBMITTALS.**

- A. After review by City of each Submittal, material will be returned to Contractor with actions defined as follows:
  - 1. NO EXCEPTIONS TAKEN - Accepted subject to its compatibility with general design concept of the Work, future Submittals and additional partial Submittals for any portions of the Work not covered in this Submittal. Does not constitute acceptance or deletion of specified or required items not shown on the Submittal.
  - 2. MAKE CORRECTIONS NOTED (NO RESUBMISSIONS REQUIRED) - Same as item 1 above, except that minor corrections as noted shall be made by Contractor.
  - 3. REVISE AS NOTED AND RESUBMIT - Rejected because of major inconsistencies or errors that shall be resolved or corrected by Contractor prior to subsequent review by City.
  - 4. REJECTED - RESUBMIT - Submitted material does not conform to Drawings and/or Specifications in major respect, i.e.: wrong size, model, capacity, or material.

- B. Favorable review will not constitute acceptance by City of any responsibility for the accuracy, coordination, or completeness of the Submittals. Accuracy, coordination, and completeness of Submittals shall be sole responsibility of Contractor, including responsibility to back-check comments, corrections, and modifications from City's review before fabrication. Contractor, Subcontractors, or suppliers may prepare Submittals, but Contractor shall ascertain that Submittals meet requirements of Contract Documents, while conforming to structural space and access conditions at point of installation. City's review will be only to assess if the items covered by the Submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as indicated by the Contract Documents. Favorable review of Submittal, method of Work, or information regarding materials and equipment Contractor proposes to furnish shall not relieve Contractor of responsibility for errors therein and shall not be regarded as assumption of risks or liability by City, or any officer or employee thereof, and Contractor shall have no claim under Contract Documents on account of failure or partial failure or inefficiency or insufficiency of any plan or method of Work or material and equipment so accepted. Favorable review shall be considered to mean merely that City has no objection to Contractor using, upon Contractor's own full responsibility, plan or method of Work proposed, or furnishing materials and equipment proposed.
- C. Unless otherwise specified, City's review will not extend to the means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
- D. Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been favorably reviewed by the City; otherwise, any such Work is at Contractor's sole risk.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 4100

## REGULATORY REQUIREMENTS

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section includes:
1. Regulatory requirements applicable to Contract Documents
  2. Required provisions under Local Agency Disputes Act
  3. Required references under federal law

## 1.02 GENERAL

- A. Compliance with Laws
1. Conform to all applicable codes, laws, ordinances, rules and regulations, which shall have full force and effect as though printed in full in these Specifications. Codes, laws, ordinances, rules, regulations and ordinances (**Regulatory Requirements**) are not furnished to Contractor, because Contractor is assumed to be familiar with these requirements.
  2. Any listing of Regulatory Requirements for hazardous waste abatement Work in the Contract Documents is supplied to Contractor as a courtesy and shall not limit Contractor's responsibility for complying with all applicable Regulatory Requirements having application to the Work. Where conflict among the Regulatory Requirements or with these Specifications occurs, the most stringent requirements shall be used.
  3. Specific reference in the Specifications to codes and regulations or requirements of regulatory agencies shall mean the latest printed edition of each adopted by the regulatory agency in effect at the time of the opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
- B. Precedence
1. Where specified requirements differ from Regulatory Requirements, the more stringent requirements shall take precedence. Where Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by Regulatory Requirements, then Drawings and Specifications shall take precedence so long as such increase is legal. Where no requirements are identified on Drawings or in Specifications, comply with all Regulatory Requirements of governing authorities having jurisdiction.
  2. Should any conditions develop not covered by the Contract Documents wherein the finished Work will not comply with current codes, a Change Order detailing and specifying the required Work shall be submitted to and approved by City before proceeding with the Work.

## 1.03 REGULATORY REQUIREMENTS

- A. Applicable Codes
1. Codes that apply to Contract Documents include all Codes applicable to construction, including, but not limited to, the following:
    - a. California Building Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for all construction work.

- b. California Electrical Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for all construction work.
  - c. California Plumbing Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for plumbing, sewage disposal and health requirements.
  - d. California Mechanical Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for all construction work.
  - e. California Energy Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for all construction work.
  - f. California Green Building Standard Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for all construction work.
  - g. International Fire Code (2016 Edition or latest applicable code) as amended by applicable local ordinances for all construction work.
  - h. California Administrative Code Titles 15, 19 and 24 (with California amendments), and Americans with Disabilities Act (ADA) accessibility guidelines, whichever is more stringent.
  - i. All State laws and City and County Ordinances, rules of the State or City or County Health Departments, rules of the National Board of Fire Underwriters and National Fire Protection Associations, and local power company regulations for mechanical and electrical work.
- B. Applicable Laws, Statutes, Ordinances, Rules, And Regulations
1. During prosecution of Work to be done under Contract Documents, Contractor shall comply with applicable laws, ordinances, rules and regulations, including, but not limited to, the following:
    - a. Federal:
      - 1) Americans With Disabilities Act of 1990
      - 2) 29 CFR, Section 1910.1001, Asbestos
      - 3) 40 CFR, Subpart M, National Emission Standards for Asbestos
      - 4) Executive Order 11246
      - 5) Federal Endangered Species Act
      - 6) Clean Water Act
    - b. State of California:
      - 1) California Code of Regulations, Titles 5, 8, 17, 19, 21, 22, 24 and 25
      - 2) California Public Contract Code
      - 3) California Health and Safety Code
      - 4) California Government Code
      - 5) California Labor Code
      - 6) California Civil Code
      - 7) California Code of Civil Procedure
      - 8) CPUC General Order 95, Rules for Overhead Electric Line Construction
      - 9) CPUC General Order 128, Rules for Construction of Underground Electric Supply and Communications Systems
      - 10) Cal/OSHA
      - 11) OSHA: Hazard Communications Standards
      - 12) California Endangered Species Act
      - 13) Water Code
      - 14) Fish and Game Code
    - c. State of California Agencies:
      - 1) State and Consumer Services Agency
      - 2) Office of the State Fire Marshall
      - 3) Office of Statewide Health Planning and Development
      - 4) Department of Fish and Game
      - 5) All Air Quality Management Districts with jurisdiction
      - 6) All Regional Water Quality Control Boards with jurisdiction
      - 7) Division of the State Architect (if having jurisdiction)
    - d. All Local Agencies with jurisdiction (cities, counties, fire departments)
- C. Change Orders and Claims:

1. The California Public Contract Code, including but not limited to Section 7105(d)(2), and the California Government Code Section 930.2 et seq., apply to all contract procedures for changes, time extensions, change orders (time or compensation) and claims. Federal law (U.S. v. Holpuch 326 U.S. 234) shall supplement California law on the enforceability of these requirements.
2. Any change, waiver, or omission to implement contract change order and claim procedures shall have no legal effect unless expressly permitted in a fully executed change order approved by Contractor and City and approved as to form by their respective legal counsel.

D. Required Provisions On Contract Claim Resolution

1. The California Public Contract Code specifies required provisions on resolving contract claims less than \$375,000, which are set forth below, and constitute a part of this Contract.
2. For the purposes of this section, "Claim" means a separate demand by Contractor of \$375,000 or less for (1) a time extension, (2) payment or money or damages arising from Work done by or on behalf of Contractor arising under the Contract Documents and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) an amount the payment of which is disputed by City. In order to qualify as a Claim, the written demand must state that it is a Claim submitted under paragraph 12 of Document 00 7200 (General Conditions) and be submitted in compliance with all requirements of Document 00 7200 (General Conditions), paragraph 12. Separate Claims which total more than \$375,000 do not qualify as a "separate demand of \$375,000 or less," as referenced above, and are not subject to this section.
3. A voucher, invoice, payment application, or other routine or authorized form of request for payment is not a Claim for purposes of this section. If such request is disputed as to liability or amount, then the disputed portion of the submission may be converted to a Claim under this section by submitting a separate claim in compliance with Contract Documents claim submission requirements.
4. Caution. This section does not apply to tort claims and nothing in this section is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 and Chapter 2 of Part 3 of Division 3.6 of Title 1 of the California Government Code.
5. Procedure:
  - a. The Claim must be in writing, submitted in compliance with all requirements of Document 00 7200 (General Conditions), paragraph 12, including, but not limited to, the time prescribed by and including the documents necessary to substantiate the Claim, pursuant to Document 00 7200 (General Conditions), paragraph 12.3. Claims must be filed on or before the day of final payment. Nothing in this section is intended to extend the time limit or supersede notice requirements for the filing of claims as set forth in Document 00 7200 (General Conditions), paragraph 12 or elsewhere in the Contract Documents.
  - b. For Claims of fifty thousand dollars (\$50,000) or less, City shall respond in writing within forty-five (45) calendar days of receipt of the Claim, or City may request in writing within thirty (30) calendar days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims City may have against Claimant. If additional information is thereafter required, it shall be requested and provided in accordance with this section upon mutual agreement of City and Claimant. City's written response to the Claim, as further documented, shall be submitted to Claimant within fifteen (15) calendar days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.
  - c. For Claims over Fifty Thousand Dollars (\$50,000) and less than or equal to \$375,000: City shall respond in writing within sixty (60) calendar days of receipt of the Claim, or City may request in writing within thirty (30) calendar days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims City may have against Claimant. If additional information is thereafter required, it shall be requested and provided in accordance with this section, upon mutual agreement of City and Claimant;



City's written response to the Claim, as further documented, shall be submitted to Claimant within thirty (30) calendar days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.

- d. Meet and Confer: If Claimant disputes City's written response, or City fails to respond within the time prescribed above, Claimant shall notify City, in writing, either within fifteen (15) calendar days of receipt of City's response or within fifteen (15) calendar days of City's failure to timely respond, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon demand City will schedule a meet and confer conference within thirty (30) calendar days for settlement of the dispute.
- e. Following the meet and confer conference, if the Claim or any portion remains in dispute, Claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the California Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time Claimant submits its written claim as set forth herein, until the time that Claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

**E. Compliance With Americans With Disabilities Act**

1. Contractor acknowledges that, pursuant to the Americans with Disabilities Act (ADA), programs, services and other activities provided by a public entity to the public, whether directly or through a Contractor, must be accessible to the disabled public. Contractor shall provide the services specified in the Contract Documents in a manner that complies with the ADA and any and all other applicable federal, state and local disability rights legislation. Contractor agrees not to discriminate against disabled persons in the provision of services, benefits or activities provided under the Contract Documents and further agrees that any violation of this prohibition on the part of Contractor, its employees, agents or assigns shall constitute a material breach of the Contract Documents.

**F. Compliance With IRCA**

1. Contractor acknowledges that Contractor, and all subcontractors hired by Contractor to perform services under this Agreement, are aware of and understand the immigration Reform and Control Act ("IRCA"). Contractor is and shall remain in compliance with the IRCA and shall ensure that any subcontractors hired by Contractor to perform services under this Agreement are in compliance with the IRCA. In addition, Contractor agrees to indemnify, defend and hold harmless City, its agents, officers and employees, from any liability, damages or causes of action arising out of or relating to any claims that Contractor's employees, or employees of any subcontractor hired by Contractor, are not authorized to work in the United States for Contractor or its subcontractor and/or any other claims based upon alleged IRCA violations committed by Contractor or Contractor's subcontractors.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 4200

## REFERENCES AND DEFINITIONS

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Reference standards, abbreviations, symbols, and definitions used in Contract Documents.
2. Full titles are given in this Section for standards cited in other Sections of Specifications.

1.02 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES;  
REPORTING AND RESOLVING DISCREPANCIES

## A. References

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code, or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.
2. If during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such law or regulation applicable to the performance of the Work or of any such standard, specification, manual, or code or of any instruction of any supplier, Contractor shall report it in writing at once to City's Representative and Architect/Engineer, and Contractor shall not proceed with the Work affected thereby until consent to do so is given by City.

## B. Precedence

1. Except as otherwise specifically stated in the Contract Documents or as may be provided by Change Order, CCD, or Supplemental Instruction, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
  - a. The provisions of any such standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
  - b. The provisions of any such laws or regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such law or regulation).
2. No provision of any such standard, specification, manual, code, or instruction shall be effective to change the duties and responsibilities of City, City's Representative, Architect/Engineer or Contractor, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents, nor shall it be effective to assign to City, Architect/Engineer, or any of their consultants, agents, representatives or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

## C. Referenced Grades, Classes, and Types:

1. Where an alternative or optional grade, class, or type of product or execution is included in a reference but is not identified in Drawings or in Specifications, provide the highest, best, and

greatest of the alternatives or options for the intended use and prevailing conditions.

D. Edition Date of References:

1. When an edition or effective date of a reference is not given, it shall be understood to be the current edition or latest revision published as of the date of opening Bids.
2. All amendments, changes, errata and supplements as of the effective date shall be included.

E. **ASTM and ANSI References:** Specifications and Standards of the American Society for Testing and Materials (ASTM) and the American National Standards Institute (ANSI) are identified in the Drawings and Specifications by abbreviation and number only and may not be further identified by title, date, revision, or amendment. It is presumed that Contractor is familiar with and has access to these nationally- and industry-recognized specifications and standards.

### 1.03 DEFINITIONS

A. Meaning of Words and Phrases

Wherever any of the words or phrases defined below, or a pronoun used in place thereof, is used in any part of the Contract Documents, it shall have the meaning here set forth. Where abbreviations and symbols are used, such abbreviations and symbols shall be given their common meaning in the construction industry. In the Contract Documents, the neuter gender includes the feminine and masculine, and the singular number includes the plural.

While City has made an effort to identify all defined terms with initial caps, the following definitions shall apply regardless of case unless the context otherwise requires:

1. Addenda: Written or graphic instruments issued prior to the opening of Bids, which clarify, correct, or change the bidding requirements or the Contract Documents. Addenda shall not include the minutes of the Pre-Bid Conference and/or Site Visit.
2. Agreement (Document 00 5200): Agreement is the basic Contract Document that binds the parties to construction Work. Agreement defines relationships and obligations between City and Contractor and by reference incorporates Conditions of Contract, Drawings, and Specifications and contains Addenda and all Modifications subsequent to execution of Contract Documents.
3. Alternate: Work added to or deducted from the base Bid, if accepted by City.
4. Application for Payment: Written application for monthly or periodic progress or final payment made by Contractor complying with the Contract Documents.
5. Approved Equal: Approved in writing by City as being of equivalent quality, utility and appearance.
6. Architect/Engineer: If used elsewhere in the Contract Documents, "Architect/Engineer" shall mean a person (or that person's firm) holding a valid California State Architect's or Engineer's license representing the City in the administration of the Contract Documents. Architect/Engineer may be an employee of or an independent consultant to City. When Architect/Engineer is referred to within the Contract Documents and not an employee of City, Architect/Engineer shall be construed to include employees of Architect/Engineer and/or employees that Architect/Engineer supervises. When the designated Architect/Engineer is an employee of City, his or her authorized representatives on the Project will be included under the term Architect/Engineer. If Architect/Engineer is an employee of City, Architect/Engineer is the beneficiary of all Contractor obligations to City, including without limitation, all releases and indemnities. Architect/Engineer may also be referred to as Architect or Engineer.
7. Asbestos: Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by OSHA or Cal/OSHA.

8. Bid: The offer or proposal of the Bidder submitted on the prescribed form(s) setting forth the prices for the Work to be performed.
9. Bidder: One who submits a Bid.
10. Bidding Documents: All documents comprising the Project Manual (including all documents and Specification Sections listed in Document 00 0110 [Table of Contents]), including documents supplied for bidding purposes only and Contract Documents.
11. Board: The governing body of the City.
12. Business Day: Any Day other than Saturday, Sunday, and the following days that have been designated as holidays by City. If a holiday falls on a Saturday, the preceding Friday will be the holiday. If a holiday falls on a Sunday, the following Monday will be the holiday.
  - a. New Year's Day, January 1;
  - b. Martin Luther King Jr.'s Birthday, third Monday in January;
  - c. Lincoln's Birthday, February 12;
  - d. Presidents' Day, third Monday in February;
  - e. Malcolm X Day, third Friday in May;
  - f. Memorial Day, last Monday in May;
  - g. Juneteenth, June 19;
  - h. Independence Day, July 4;
  - i. Labor Day, first Monday in September;
  - j. Indigenous People's Day, second Monday in October;
  - k. Veterans' Day, November 11;
  - l. Thanksgiving Day, as designated by the President;
  - m. The Day following Thanksgiving Day;
  - n. Christmas Day, December 25; and
  - o. Each day appointed by the Governor of California and formally recognized by the Governing Board as a day of mourning, thanksgiving, or special observance.
13. By City: Work that will be performed by City or its agents at the City's expense.
14. By Others: Work that is outside scope of Work to be performed by Contractor under this Contract, which will be performed by City, other contractors, or other means.
15. Change Order: A written instrument prepared by City and signed by City and Contractor, stating their agreement upon all of the following:
  - a. a change in the Work;
  - b. the amount of the adjustment in the Contract Sum, if any; and
  - c. the amount of the adjustment in the Contract Time, if any.
16. Change Proposal Request (CPR): A document prepared by Contractor requesting or initiating a request for modifying the Contract Documents and determining costs for changes in contract amount and any requested changes to Contract Time.
17. City: City is defined in Document 00 5200 (Agreement).
18. City-Furnished, Contractor Installed: Items furnished by City at its cost for installation by Contractor at its cost under Contract Documents.
19. City's Representative(s): See Document 00 5200 (Agreement).
20. Code Inspector: A local or state agency responsible for the enforcement of applicable codes and regulations.
21. Concealed: Work not exposed to view in the finished Work, including within or behind various construction elements.
22. Construction Change Directive ("CCD"): A written order prepared and signed by City, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both.

23. Contract Amount: a change order price, line item price, Contract Sum, or other price assigned to a scope of work.
24. Contract Conditions or Conditions of the Contract: Consists of two parts: General Conditions and Supplementary Conditions.
  - a. General Conditions are general clauses that are common to the City Contracts, including Document 00 7200 (General Conditions).
  - b. Supplementary Conditions modify or supplement General Conditions to meet specific requirements for Contract Documents, including Document 00 7201 (Supplementary Conditions).
25. Contract Documents and Contract: Contract Documents and Contract shall consist of the documents identified as the Contract Documents in Document 00 5200 (Agreement), plus all changes, Addenda, and modifications thereto.
26. Contract Modification: Either:
  - a. a written amendment to Contract signed by Contractor and City; or
  - b. a Change Order; or
  - c. a Construction Change Directive; or
  - d. a written directive for a minor change in the Work issued by City.
27. Contract Sum: The sum stated in the Agreement and, including authorized adjustments, the total amount payable by City to Contractor for performance of the Work and the Contract Documents. The Contract Sum is also sometimes referred to as the Contract Price or the Contract Amount.
28. Contract Time: The number or numbers of calendar days or the dates stated in the Agreement to achieve Substantial Completion of the Work or designated Milestones; and/or to achieve Final Completion of the Work so that it is ready for final payment and is accepted.
29. Contractor: The person or entity identified as such in the Agreement and referred to throughout the Contract Documents as if singular in number and neutral in gender. The term "Contractor" means the Contractor or its authorized representative.
30. Contractor's Employees: Persons engaged in execution of Work under Contract as direct employees of Contractor, as Subcontractors, or as employees of Subcontractors.
31. Day: One calendar day of 24 hours measured from midnight to the next midnight, unless the word "day" is specifically modified to the contrary.
32. Defective: An adjective which, when modifying the word "Work," refers to Work that is unsatisfactory or unsuited for the use intended, faulty, or deficient, that does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents (including but not limited to approval of Samples and "or equal" items), or has been damaged prior to final payment (unless responsibility for the protection thereof has been assumed by City). Unapproved substitutions are defective. City is the judge of whether Work is Defective.
33. Division of State Architect: A division of the State of California providing, design and construction oversight for K-12 schools and community colleges, and developing and maintaining accessibility standards and codes utilized in public and private buildings throughout the State of California.
34. Drawings: The graphic and pictorial portions of Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
35. Equal: Equal in opinion of City. Burden of proof of equality is responsibility of Contractor.
36. Final Acceptance or Final Completion: City's acceptance of the Work as satisfactorily completed in accordance with Contract Documents. Requirements for Final Acceptance/Final

Completion include, but are not limited to:

- a. Final cleaning is completed.
  - b. All systems having been tested and accepted as having met requirements of Contract Documents.
  - c. All required instructions and training sessions having been given by Contractor.
  - d. All Project Record Documents having been submitted by Contractor, reviewed by City, and accepted by City.
  - e. All punch list Work, as directed by City, having been completed by Contractor.
  - f. Generally all Work, except Contractor maintenance after Final Acceptance/Final Completion, having been completed to satisfaction of City.
37. Force Account: Work directed to be performed without prior agreement as to lump sum or unit price cost thereof, and which is to be billed at cost for labor, materials, equipment, taxes, and other costs, plus a specified percentage for overhead and profit.
  38. Exposed: Work exposed to view in the finished Work, including behind louvers, grilles, registers and various other construction elements.
  39. Furnish: Supply Indicated: Shown or noted on the Drawings.
  40. Indicated: Shown or noted on the Drawings.
  41. Install: Install or apply only, do not furnish.
  42. Latent: Not apparent by reasonable inspection, including but not limited to, the inspections and research required as a condition to bidding under Document 00 7200 (General Conditions).
  43. Law: Unless otherwise limited, all applicable laws including without limitation all federal, state, and local laws, statutes, standards, rules, regulations, ordinances, and judicial and administrative decisions.
  44. Material: This word shall be construed to embrace machinery, manufactured articles, materials of construction (fabricated or otherwise), and any other classes of material to be furnished in connection with Contract, except where a more limited meaning is indicated by context.
  45. Milestone: A principal event specified in Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all Work.
  46. Modification: Same as Contract Modification.
  47. Not in Contract or "NIC": Work that is outside the scope of Work to be performed by Contractor under Contract Documents.
  48. Notice of Completion: Shall have the meaning provided in California Civil Code §3093, and any successor statute.
  49. Off Site: Outside geographical location of the Project.
  50. Owner: Owner is the City of Berkeley, see Document 00 5200 (Agreement).
  51. Partial Utilization: Use by City of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all of the Work.
  52. PCBs: Polychlorinated byphenyls.
  53. Phase: A specified portion of the Work (if any) specifically identified as a Phase in Document 00 5200 (Agreement) or Document 01 1100 (Summary).
  54. Product Data: That information (brochures, catalog sheets, manufacturer's cut sheets, etc.) supplied by vendors having technical and commercial characteristics of the supplied equipment or materials and accompanying commercial terms such as warranties, instructions, and manuals.
  55. Progress Report: A periodic report submitted by Contractor to City with progress payment

invoices accompanying progress schedule. See Document 00 7200 (General Conditions).

56. Project: Total construction of which Work performed under Contract Documents may be whole or part.
57. Project Manager: If used elsewhere in the Contract Documents, "Project Manager" shall mean a person representing the City in the administration of the Contract Documents. Project Manager may be an employee of or an independent consultant to City. When Project Manager is referred to within the Contract Documents and no Project Manager has in fact been designated, then the matter shall be referred to City. The term Project Manager shall be construed to include employees of Project Manager and/or employees that Project Manager supervises. When the designated Project Manager is an employee of City, his or her authorized representatives on the Project will be included under the term Project Manager. If Project Manager is an employee of City Project Manager is the beneficiary of all Contractor obligations to City, including without limitation, all releases and indemnities.
58. Project Manual: Project Manual consists of Bidding Requirements, Agreement, Bonds, Certificates, Contract Conditions, Drawings, and Specifications.
59. Project Record Documents: All Project deliverables required under the Contract Documents, including without limitation, as built drawings; Installation, Operation, and Maintenance Manuals; and Machine Inventory Sheets.
60. Provide: Furnish and install.
61. Request for Information ("RFI"): A document prepared by Contractor requesting information regarding the Project or Contract Documents. The RFI system is also a means for City to submit Contract Document clarifications or supplements to Contractor.
62. Request for Proposals ("RFP"): A document issued by City to Contractor whereby City may initiate changes in the Work or Contract Time as provided in Contract Documents.
63. Request for Substitution ("RFS"): A document prepared by Contractor requesting substitution of materials as permitted and to the extent permitted in Contract Documents.
64. RFI-Reply: A document consisting of supplementary details, instructions, or information issued by City that clarifies or supplements Contract Documents, and with which Contractor shall comply. RFI-Replies do not constitute changes in Contract Sum or Contract Time except as otherwise agreed in writing by City. RFI-Replies will be issued through the RFI administrative system.
65. Samples: Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
66. Shop Drawings: All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
67. Shown: As indicated on Drawings.
68. Site: The particular geographical location of Work performed pursuant to the Contract Documents.
69. Specifications: The written portion of the Contract Documents consisting of requirements for materials, equipment, construction systems, standards, and workmanship for the Work; performance of related services.
70. Specified: As written in Specifications.
71. Subcontractor: A person or entity that has a direct contract with Contractor to perform a portion of the Work at the Site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and neutral in gender and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a

separate contractor or subcontractors of a separate contractor.

72. Substantial Completion: The Work (or a specified part thereof) has progressed to the point where, in the opinion of City as evidenced by a notice or certificate of Substantial Completion, the Work is sufficiently complete, in accordance with Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended, and unperformed or incomplete work elements are minor in nature; or if no such certificate is issued, when the Work (or specified part) is complete and ready for final payment as evidenced by written recommendation of City for final payment. The terms "Substantially Complete" and "Substantially Completed" as applied to all or part of the Work refer to Substantial Completion thereof.
73. Supplemental Instruction: A written directive from City to Contractor ordering alterations or Modifications that do not result in change in Contract Sum or Contract Time, and do not substantially change Drawings or Specifications.
74. Testing and Special Inspection Agency: An independent entity engaged to inspect and/or test the workmanship, materials, or manner of construction of buildings or portions of buildings, to determine if such construction complies with the Contract Documents and applicable codes.
75. Time Impact Evaluation (TIE): A written narrative and a schedule diagram depicting how the changed Work or other impact affects other scheduled activities, prepared by Contractor in conjunction with a Change Proposal Request (CPR) for Change Orders, Time Extensions, and Delays. See Document 01 3230 (Progress Schedules and Submittals), and Document 01 2600 (Modification Procedures).
76. Underground Facilities: All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities that have been installed underground to furnish any of the following services or materials: Electricity, gases, chemicals, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, or water.
77. Unit Price Work: Shall be the portions of the Work for which a unit price is provided in Document 00 5200 (Agreement) or Section 01 1100 (Summary).
78. Work: The entire completed construction, or the various separately identifiable parts thereof, required to be furnished under the Contract Documents within the Contract Time. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents including everything shown in the Drawings and set forth in the Specifications. Wherever the word "work" is used, rather than the word "Work," it shall be understood to have its ordinary and customary meaning.

#### B. Other Defined Terms

The following terms are not necessarily identified with initial caps; however they shall have the meaning set forth below:

1. Wherever words "as directed," "as required," "as permitted," or words of like effect are used, it shall be understood that direction, requirements, or permission of City is intended. Words "sufficient," "necessary," "proper," and the like shall mean sufficient, necessary, or proper in judgment of City. Words "approved," "acceptable," "satisfactory," "favorably reviewed," or words of like import, shall mean approved by, or acceptable to, or satisfactory to, or favorably reviewed by City.
2. Wherever the word "may" or "ought" is used, the action to which it refers is discretionary. Wherever the word "shall" or "will" is used, the action to which it refers is mandatory.

## PART 2 - PRODUCTS – NOT USED



**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

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## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 4500

## TESTING AND INSPECTION

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section Includes:
1. Regulatory requirements for testing and inspection.
  2. Contractor's quality control.
  3. Quality of the Work.
  4. Inspections and tests by governing authorities.
  5. Inspections and tests by serving utilities.
  6. Inspections and tests by manufacturer's representatives.
  7. Inspections by Independent Testing and Inspection Agency.

## 1.02 RELATED SECTIONS

- A. Document 00 7200 General Conditions
- B. Section 01 4100 Regulatory Requirements

## 1.03 CONTRACTOR'S QUALITY CONTROL

- A. Contractor's Quality Control: Contractor shall ensure that products, services, workmanship and site conditions comply with requirements of the Drawings and Specifications by coordinating, supervising, testing and inspecting the work and by utilizing only suitably qualified personnel.
- B. Quality Requirements: Work shall be accomplished in accordance with quality requirements of the Drawings and Specifications, including, by reference, all Codes, laws, rules, regulations and standards. When no quality basis is prescribed, the quality shall be in accordance with the best accepted practices of the construction industry for the locale of the Project, for projects of this type.
- C. Quality Control Personnel: Contractor shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.

## 1.04 QUALITY OF THE WORK

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects and fit for the intended use.
- B. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements.
- C. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling and staining, until Acceptance by the City.
- D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report

requirements in preparing, fabricating erecting, installing, applying, connecting and finishing Work.

- E. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.
- F. Verification of Quality: Work shall be subject to verification of quality by City or Architect/Engineer in accordance with provisions of the General Conditions of the Contract.
  - 1. Contractor shall cooperate by making Work available for inspection by City, Architect/Engineer or their designated representatives.
  - 2. Such verification may include mill, plant, shop, or field inspection as required.
  - 3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
  - 4. Provide all information and assistance as required, including that by and from subcontractors, fabricators, materials suppliers and manufacturers, for verification of quality by City or Architect/Engineer.
  - 5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the General Conditions of the Contract.
- G. Observations by Architect/Engineer: Periodic and occasional observations of Work in progress will be made by Architect/Engineer as deemed necessary to review progress of Work and general conformance with design intent.
- H. Limitations on Inspection, Test and Observation: Neither employment of independent testing and inspection agency nor observations by Architect/Engineer shall in way relieve Contractor of obligation to perform Work in full conformance to all requirements of Contract Documents.
- I. Rejection of Work: City reserves the right to reject all Work not in conformance to the requirements of the Drawings and Specifications.
- J. Correction of Non-Conforming Work: Non-conforming Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time.
- K. Acceptance of Non-Conforming Work: Acceptance of nonconforming Work, without specific written acknowledgement and approval of the City, shall not relieve the Contractor of the obligation to correct such Work.
- L. Contract Adjustment for Non-Conforming Work: Should City determine that it is not feasible or in City's interest to require non-conforming Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between City and Contractor. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with applicable provisions of the General Conditions.

#### **1.05 INSPECTIONS AND TESTS BY GOVERNING AUTHORITIES**

- A. Regulatory Requirements for testing and Inspection: Comply with Uniform Building Code (UBC) requirements and all other requirements of governing authorities having jurisdiction.
- B. Inspections and Tests by Governing Authorities: Contractor shall cause all tests and inspections required by governing authorities having jurisdiction to be made for Work under this Contract.
  - 1. Such authorities include the Division of Occupational Safety and Health (Cal/OSHA), City of Berkeley Public Works Department, Fire Department, and similar agencies.
  - 2. Except as specifically noted, scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.

**1.06 INSPECTIONS AND TESTS BY SERVING UTILITIES**

- A. Inspections and Tests by Serving Utilities: Contractor shall cause all tests and inspections required by serving utilities to be made for Work under this Contract. Scheduling conducting and paying for such inspections shall be solely the Contractor's responsibility.

**1.07 INSPECTIONS AND TESTS BY MANUFACTURER'S REPRESENTATIVES**

- A. Inspections and Tests by Manufacturer's Representatives: Contractor shall cause all tests and inspections specified to be conducted by materials or systems manufacturers to be made. Additionally, all tests and inspections required by materials or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contract Sum.

**1.08 INSPECTIONS BY INDEPENDENT TESTING AND INSPECTION AGENCY**

- A. City will select an independent testing and inspection agency or agencies to conduct tests and inspections as indicated on Drawings, in Specifications and as required by governing authorities having jurisdiction.
- B. Responsibility for payment for tests and inspections shall be as indicated in schedule below. All time and costs for Contractor's service related to such tests and inspections shall be included in Contract Time and Contract Sum.
- C. Contractor shall notify City and, if directed by City, testing and inspection agency, when Work is ready for specified tests and inspections.
- D. Contractor shall pay for all additional charges by testing and inspection agencies and governing authorities having jurisdiction due to the following:
  - 1. Contractor's failure to properly schedule or notify testing and inspection agency or authorities having jurisdiction.
  - 2. Changes in sources, lots or suppliers of products after original tests or inspections.
  - 3. Changes in means methods, techniques, sequences and procedures of construction which necessitate additional testing, inspection and related services.
  - 4. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.
- E. Tests and inspections shall include the following:

<u>Section</u>	<u>Inspections and Tests</u>	<u>Paid by</u>
Section 03 2000- Concrete Reinforcing	Steel-reinforcement placement	Paid by City
Section 03 3000- Cast-in-place Concrete	Headed bolts and studs Design mixture verification Concrete placement Curing procedures Concrete strength verification Batch plant inspections Slump Test Compression Test Compressive-Strength Test	Paid by City
Section 03 3200- Cast-in-place Concrete Landscape	Concrete placement Concrete Test  Reinforcement placement	Paid by City

	Expansion and Adhesive anchors	
Section 04 2200- Concrete Unit Masonry	Mortar verification Grout verification Reinforcement verification Concrete Masonry Unit Test Mortar aggregate ratio test Mortar Test Grout Test Prism Test	Paid by City
Section 05 1200- Structural Steel Framing	Bolt connections Welded connections Weld Test Liquid penetrant Magnetic particle Ultrasonic Radiographic	Paid by City
Section 05 3100- Steel Decking	Weld Test Cold-formed steel floor Roof Deck	Paid by City
Section 09 7720- Fabric Wrapped Panels	Wall Surface Cleanliness Wall Surface Flatness	Paid by Contractor
Section 21 1000- Water Based Fire Suppression Systems	Fire Suppression Test	Paid by Contractor
Section 22 0590- Pressure Testing For Plumbing	Sanitary and roof drainage Test Domestic Water Test	Paid by Contractor
Section 23 7200- Air to Air Energy Recovery Units	Testing and Adjusting Performance Test	Paid by Contractor
Section 26 0519- Low-Voltage Electrical Power Conductors and Cables	NETA ATS inspections and tests Insulation Resistance Test	Paid by Contractor
Section 26 0526- Grounding and Bonding for Electrical Systems	NETA ATS inspections and tests Ground Electrode Resistance Test	Paid by Contractor
Section 26 0529- Hangers and Supports For Electrical Systems	Support and attachment	Paid by Contractor

Section 26 2413- Switchboards	NETA ATS inspections and tests	Paid by Contractor
Section 26 2726- Wiring Devices	Wiring device Receptacle Test GFCI Receptacle Test	Paid by Contractor
Section 26 2816- Enclosed Circuit Breakers	NETA ATS inspections and tests	Paid by Contractor
Section 26 3100- PV & Battery System	System Testing	Paid by Contractor
Section 26 5100- Interior Lighting	Luminaire inspection and testing	Paid by Contractor
Section 26 5600- Exterior Lighting	Luminaire inspection and testing	Paid by Contractor
Section 26 5600- Hangers and Supports for Communications Systems	Support and attachment	Paid by Contractor
Section 27 1000- Structured Cabling	Visual inspection Voice jack testing	Paid by Contractor
Section 31 2000- Earth Moving	Compaction	Paid by City
Section 31 2100- Utility Trenching and Backfill	Compaction	Paid by City
Section 32 8400- Irrigation	Pressure Testing Coverage Test Controllers Test	Paid by Contractor
Section 33 1000- Water System	Hydrostatic Test Leakage Test Bacteriological Testing	Paid by Contractor
Section 33 3000- Sanitary Sewer System	Hydrostatic Test Vacuum Test Deflection Testing Warranty Period Test Television Inspection	Paid by Contractor

Section 33 4100-  
Storm Utility  
Drainage Piping

Deflection Testing  
Television Inspection

Paid by Contractor

Test and Inspection Reports: After each inspection and test, one copy of report shall be promptly submitted each to Architect/Engineer, City, City's field representative, Contractor and to agency having jurisdiction (if required by Code).

1. Reports shall clearly identify the following:
    - a. Date issued.
    - b. Project name and number.
    - c. Identification of product and Specifications Section in which Work is specified.
    - d. Name of inspector.
    - e. Date and time of sampling or inspection.
    - f. Location in Project where sampling or inspection was conducted.
    - g. Type of inspection or test.
    - h. Date of test.
    - i. Results of tests.
    - j. Comments concerning conformance with Contract Documents and other requirements.
  2. Test reports shall indicate specified or required values and shall include statement whether test results indicate satisfactory performance of products.
  3. Samples taken but not tested shall be reported.
  4. Test reports shall confirm that methods used for sampling and testing conform to specified test procedures.
  5. When requested, testing and inspection agency shall provide interpretations of test results.
  6. Verification reports shall be prepared and submitted, stating that tests and inspections specified or otherwise required for the project, have been completed and that material and workmanship comply with the Contract Drawings and Specifications. Verification reports shall be submitted at intervals not exceeding 6 months, at Substantial Completion of the Project, and at all times when Work of Project is suspended.
- F. Contractor Responsibilities in Inspections and Tests:
1. Notify testing and inspection agencies 24 hours in advance of expected time for operations requiring inspection and testing services.
  2. Deliver to laboratory or designated location, adequate samples of materials proposed to be used which require advance testing, together with proposed mix designs.
  3. Cooperate with testing and inspection agency personnel, City's field representative, Architect/Engineer. Provide access to Work areas and off-site fabrication and assembly locations, including during weekends and after normal work hours.
  4. Provide incidental labor and facilities to provide safe access to Work to be tested and inspected, to obtain and handle samples at the Project site or at source of products to be tested, and to store and cure test samples.
  5. Provide, at least 15 calendar days in advance of first test or inspection of each type, a schedule of tests or inspections indicating types of tests or inspections and their scheduled dates.
  6. Provide 24 hours advance notice to the Project Manager, Architect/Engineer of each test and inspection, as directed.
    - a. When tests or inspections cannot be performed after such notice, reimburse City for Testing Laboratory personnel and travel expenses incurred due to Contractor's negligence.

#### **1.09 ADDITIONAL TESTING AND INSPECTION**



- A. If initial tests or inspections made by the Testing Laboratory reveal that materials do not comply with Contract Documents, or if City has reasonable doubt that materials do not comply with Contract Documents, additional tests and inspections shall be made as directed.
  - 1. If additional tests and inspections establish that materials comply with Contract Documents, all costs for such tests and inspections shall be paid by City.
  - 2. If additional tests and inspections establish that materials do not comply with Contract Documents, all costs of such tests and inspections shall be deducted for Contract Sum.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

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## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 5200

## TEMPORARY FACILITIES

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. General Conditions Document 00 7200
- B. Supplemental General Conditions Document 00 7201

## 1.02 SUMMARY

- A. This section describes the temporary facilities required for the Project site. The Project site shall be maintained by Contractor as set forth in this section unless otherwise added to or superseded by the requirements of Document 00 7200 (General Conditions).

## 1.03 TEMPORARY FACILITIES

- A. Contractor shall obtain permits for, install and maintain in safe condition, whatever scaffolds, hoisting equipment, barricades, walkways, or other temporary structures which may be required to accomplish the work on the Project. Such structures shall be adequate for the intended use and capable of safely accepting all loads that may be imposed upon them. They shall be installed and maintained in accordance with all applicable State and local codes and regulations.
- B. Contractor shall provide and maintain temporary heat from an approved source whenever in the course of the Work it may become necessary for curing and drying of materials, or to warm spaces as may be required for the installation of materials or finishes.
- C. Contractor shall provide and maintain any and all facilities that may be required for dewatering in order that work may proceed on the Project. If it is necessary for dewatering to occur continually, Contractor shall have on hand whatever spare parts or equipment that may be required to prevent interruption of dewatering.
- D. Contractor shall provide and maintain all utility services necessary to perform the work under this Contract.
- E. Materials, tools, accessories, etc., shall be stored only where directed by City. Storage area shall be kept neat and clean. Security of stored items shall be Contractor's responsibility.
- F. Flammable materials stored on site, shall be stored in a safe and secure manner per the manufacture's direction. Extra precautions, including clear identification, shall be the responsibility of Contractor.
- G. Contractor shall maintain an office at the Project site that will be his headquarters for the Project. Any communications delivered to this office shall be considered as delivered to Contractor. Location and size of office shall be such that it will adequately serve the needs of Contractor's superintendent and assistants in the performance of their duties.
- H. Contractor shall promptly remove all such temporary facilities when they are no longer needed for the work or for completion of the Project, mutually agreed upon by Contractor and City.

## 1.04 SIGNS

- A. No signs may be displayed on or about the City's property (except those required by law) without the City's specific approval; the size, content, and location to be as specified by the

City.

**1.05 USE OF ROADWAYS AND WALKWAYS**

- A. Contractor shall never block or interfere with use of any existing roadway, walkway or other facility for vehicular or pedestrian traffic, from any party entitled to use it. Wherever and whenever such interference becomes necessary for the proper and convenient performance of the Work, and no satisfactory detour route exists, Contractor shall, before beginning the interference, notify City and post signs at least 72 hours in advance of such interference, and provide a satisfactory detour, including temporary bridge if necessary, or other proper facility for traffic to pass around or over the interference. Contractor shall maintain the detour in a safe and satisfactory condition as long as the interference continues, all without extra payment unless otherwise expressly stipulated in the Specifications.
- B. Contractor shall at all times comply with any and all requirements applying to the work under the transportation, circulation and parking mitigation measures, truck and construction access plan.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

## DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 5526****TRAFFIC CONTROL**

Contractor shall provide traffic control throughout the project as needed for the various traffic situations and street configurations in full conformance with the latest "California Manual on Uniform Traffic Control Devices and the Federal Highway Administration (FHWA) Manual of Uniform Traffic Control Devices (MUTCD) latest edition, as amended for use in California" herein after referred to as Traffic Control Manual. The Traffic Control Manual may be obtained online at <https://dot.ca.gov/programs/safety-programs/camutcd/camutcd-files>

As required, the Contractor shall submit a Traffic Control Plan to the City of Berkeley's Transportation Division or the California Department of Transportation (Caltrans).

Construction area signs and temporary traffic control devices shall be furnished, installed, maintained and removed by the Contractor. Traffic signage, e.g., warning signs and detour signs, may be required for this project. Contractor shall be responsible for placing all barricades for perimeter street closures as required. Per Section 501.10 – Traffic Control of the General Provisions, at main entry and exit points of each work location, the Contractor shall provide a 30" x 30" sign advising the public of the anticipated period of time that traffic delays may be anticipated. This sign will also include name and telephone number of the Contractor along with starting and completion dates of the contract. Sign will be erected 7 calendar days in advance of any work.

Construction work requiring traffic control on San Pablo Avenue (State Route 123) or Ashby Avenue (State Route 13) will require an encroachment permit from Caltrans. Contractor is solely responsible for obtaining and abiding by any necessary encroachment permits. The permit fees and other associated costs to obtain the required permits from the State of California shall be included in the cost bid for this item. Contractor shall be responsible for providing traffic control plan for encroachment permit to and obtaining approval of said traffic control plan from State of California. Contractor shall be responsible for all notification of work to, application for and obtaining work authorization number from Caltrans. Any damages arising from work related to encroachment permit shall be the responsibility of the Contractor.

The Contractor shall be responsible for posting "No Parking" signs a minimum of four calendar days in advance of concrete work, paving operations, failed area, and planning work so as to comply with the City's construction notification requirement of 4 days. Cones shall not be used as barricades. "No Parking" signs may be obtained from the City at no cost to the Contractor. The "No Parking" signs shall be updated as necessary. The Contractor shall check and maintain (e.g., re-install missing signs, reposition displaced barricades, etc.) postings on a regular basis prior to start of work.

If traffic is to be detoured over a centerline or detoured in advance of the work, detour plans must be part of the submitted Traffic Control plans and approved by the City prior to starting work. Police, Fire and Public Works Department shall be notified by the contractor at least four calendar days in advance of any work which will interfere with the normal flow of vehicular or pedestrian traffic. Intersection closure may only occur if the two adjacent intersections remain open, unless otherwise approved by the City. The Contractor shall coordinate his traffic control/diversion plan with the City, a minimum of 3 weeks prior to starting work, to assure that traffic is diverted in a safe and convenient manner.

**Truck routes shall be approved by the City prior to start of work.**

Truck traffic is not allowed on Marin Avenue within the City of Albany. Personal vehicles of the Contractor's employees shall not be parked within the area of work.

A minimum of one (paved) traffic lane, not less than 12 ft. wide, shall remain open for use by public traffic during construction operations. When construction operations are not actively in progress, not less than two such lanes shall be open to public traffic. The Contractor may be allowed to close residential streets if approved in writing in advance by the City. No work that interferes with public traffic shall be performed between 6:00 p.m. and 7:00 a.m.

Start of work shall be no earlier than 7:00 a.m. No work process, including starting, warm up, and delivery of equipment, shall be done outside of work hours. The use of vehicle horns to alert residents to move their vehicles out of the construction zone is not permitted. The Contractor should attempt to locate vehicle owners by knocking on doors.

The full width of the traveled way shall be open for use by public traffic on Saturdays, Sundays and designated legal holidays, and when construction operations are not actively in progress, unless specified otherwise.

Minor deviations from the requirements of this section concerning hours of work may be permitted upon the written request of the Contractor, if in the opinion of the City, public traffic will be better served and the work expedited. Such deviations shall not be adopted until the City provides written approval.

The traffic control system shall consist of closing traffic lanes in accordance with the Traffic Control Manual. Signs and other devices for the traffic control system shall conform to the Traffic Control Manual.

If any component in the traffic control system is damaged, displaced or ceases to operate or function as specified, from any cause during the progress of the work, the Contractor shall immediately repair said component to its original condition or replace said component and shall restore the component to its original location.

Lane closures may be made for work periods only. At the end of each work period, all components of the traffic control system shall be removed from the traveled way, shoulder and auxiliary lanes. If the Contractor so elects, said components may be stored at selected central locations approved by the City within the limits of the public right-of-way.

Sufficient barricades and flashing lights shall also be placed to supplement all traffic signs used to divert and control traffic. Signs and barricades shall be checked periodically every day and replaced or repaired as necessary. Any hazardous conditions shall be immediately eliminated.

The Contractor, at the end of each day, shall provide ADA compliant pedestrian and vehicle crossings at all street intersections. If the project is left open overnight, it shall be graded in such a way that pedestrians and vehicles can safely pass through the project. Temporary concrete, asphalt, or wood ramps shall be installed and maintained at all locations where existing ramps have been temporarily removed.

Cleanliness is extremely important. Dust producing conditions shall be eliminated as soon as they are created.

If Contractor violates any of these provisions, a fine of \$1,000 will be assessed for the first violation, \$5,000 for the second and \$10,000 for the third and further subsequent violations.

### ACCESS AND EGRESS

The Contractor shall endeavor to cooperate with all business owners and residents occupying properties fronting on the streets in the matter of access and egress. **Contractor shall maintain a clear and accessible pedestrian corridor.**

Where a business property has more than two vehicular paths of access, one path, 10 feet in width, shall remain open during all business hours, unless accepted by the City.

## LANE CLOSURES

No lane closures shall be permitted on the following streets Monday through Friday between 7:00 A.M. – 9:00 A.M. and 4:00 P.M. – 6:00 P.M., and Saturdays between 10:00 A.M. – 2:00 P.M., unless approved in advance by the City, if it can be explained why such closure cannot reasonably be avoided. On Saturdays when UC football games are scheduled all construction-related lane closures along these corridors must be reopened at least 4 hours before the start of the game and remain open for 2 hours after the conclusion of the game.

### Major Streets:

- University Avenue
- San Pablo Avenue
- Shattuck Avenue
- Telegraph Avenue
- Sacramento Street
- Martin Luther King Jr. Way
- Ashby Avenue
- College Avenue
- Gilman Avenue
- Adeline Street

Notwithstanding the above, the City reserves the right to review and comment on each individual traffic control plan based on its own merits.

Note: Routine maintenance, inconvenience to construction method or schedule, or adverse impacts on cost of work will generally not be accepted as grounds for exceptions.

**END OF SECTION**

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## DIVISION 1 GENERAL REQUIREMENTS

## SECTION 01 5700

## TEMPORARY CONTROLS

**PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. General Conditions Document 00 7200
- B. Supplemental General Conditions Document 00 7201

**1.02 SUMMARY**

- A. This section describes the temporary controls required for the Project site. The Project site shall be maintained by Contractor as set forth in this section unless otherwise added to or superseded by the requirements of Document 00 7200 (General Conditions).

**1.03 TEMPORARY CONTROLS**

- A. Contractor shall obtain permits for, install and maintain in safe condition, whatever scaffolds, equipment, shoring, barricades, walkways, or other temporary structures which may be required to accomplish the Work. Such items shall be adequate for the intended use and shall be installed and maintained in accordance with all applicable State and local codes and regulations.
- B. The Contractor shall perform a pre-construction audio/video tape survey and provide supplemental photographic documentation to adequately document the condition of existing improvements. It is the responsibility of the Contractor to adequately document the condition of existing improvements and the Contractor may be held liable for any damage or condition whose pre-existence he/she is unable to document. No additional compensation for such tape survey and still photographs will be allowed.
- C. Upon notification of the City, the Contractor shall correct any deficiencies of the temporary controls within 72 hours. The City may request City crews or contract with another contractor to perform the necessary work and repairs if the deficiencies have not been corrected after the 72-hour notification. The Contractor shall pay the cost of the work performed by the City crews or other contractor plus an additional seventy percent (70%) surcharge by deduction from payment due on the contract.
- D. The Contractor shall begin cleanup operation at least one hour before the end of each day's work, clean all paved portions of the project and paved streets leading from the project that have dust-producing materials or debris deposited upon them. The work areas shall be swept clean at the end of each day's work and at other times when directed by the City.

**1.04 DUST AND DEBRIS CONTROLS**

- A. The Contractor shall be responsible for controlling dust in the air and rocks, debris, mud or dirt which are scattered as a result of his operations on the job. The Contractor shall be responsible for cleaning all mud, rock, dust, dirt, and debris-producing materials that originate in the project area and are deposited on other public or private property by truck tires, spillages, or by other means. The Contractor shall have suitable and adequate street cleaning equipment on the project site at all times.
- B. The Contractor shall endeavor, whenever possible, to restrict the use of water to control dust for his convenience in order to conserve water during drought situations or

mandated rationing required by the Water Utility Company. Whenever flushing of streets or any other work is necessary, the Contractor shall provide filter materials at the catch basin to retain any debris and dirt flowing into the City's drainage system.

- C. The cost of the above work, including the providing of barricades, water and other materials, labor, and equipment shall be at the sole cost and expense of the Contractor.
- D. The City may determine that an emergency exists when dust, rocks, debris, mud, or dirt are scattered in the public right of way or in the private properties as a result of Contractor's activities and/or deterioration of such conditions due to rain. The emergency conditions may also be declared when traffic or the Contractor's equipment travelling through a job causes dust to fly or rocks, debris, mud, or dirt to be scattered. Similar emergency conditions may be determined by the City's Representative if the storage of materials, tools, or any other equipment related to the project, in the public rights of way, is causing any obstruction or blocks access to the neighboring properties and/or dangerously placed without proper barricades and lights and/or backfill stockpiles or debris washing away into the street gutter and catch basins.

#### **1.05 NOISE CONTROL**

- A. Equipment which operates with noise levels in excess of 85 decibels measured on the A-weighted scale defined in ANSI S-1.4 at a distance of 100 feet from the equipment is prohibited.
- B. All equipment and impact tools shall have mufflers to comply with specified noise control.
- C. Use of unusually noisy equipment, such as jackhammers and roto-hammers is prohibited.
- D. Exterior construction work is limited to the hours of 8 AM to 5 PM.
- E. Cooperate with City if an ongoing construction activity becomes objectionable by its longevity, or by overlapping into an activity started later by the City. It is understood and agreed that both parties shall cooperate so that neither will be unduly inconvenienced by this requirement.
- F. Comply by requirements specified in the various sections.

#### **1.06 CLEAN UP**

- A. The Contractor shall not allow the site of the work to become littered with trash, rubbish, and waste material but shall maintain the same in a neat and orderly condition throughout the construction period. Cleanup, debris and dust control shall be a daily maintenance requirement. The City shall have the right to determine what is or is not trash, rubbish or waste material and the place and manner of disposal.
- B. The Contractor shall maintain a neat appearance to the work. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids and cleaning solutions from surfaces to prevent marring or other damage.
- C. Broken concrete debris, and unsuitable excavated native soil during construction shall be disposed of concurrently with its removal. If stockpiling is necessary all debris shall be placed in trash bins daily and shall be removed or disposed of weekly. Any waste shall not be buried on the site or disposed of into storm drains, sanitary sewers, streams, or waterways.
- D. Forms or falsework that are to be re-used shall be stacked neatly concurrently with their removal. Forms and falsework that are not to be re-used shall be disposed of concurrently with their removal.
- E. Full compensation for conforming to the provisions in this section, not otherwise provided for, shall be considered as included in prices paid for the various contract items of work involved and no additional compensation will be allowed therefore.
- F. Sidewalks, street area, parking strips, and driveway approaches must be kept reasonably

clean at all times during construction and be completely and carefully cleaned after the work has progressed beyond the immediate vicinity to the satisfaction of the City's Representative. Reasonable cleanup is defined as no dust, rock, or mud on any portion of the public right-of-way or the private properties as a result of the Contractor's work.

#### **1.07 EMERGENCY CLEAN UP WORK**

- A. In any case in which the Contractor fails to satisfactorily complete the cleanup work described in this section, the City may determine that an emergency exists. In the event an emergency is determined by the City, the Contractor will be notified by the City to correct the violation immediately. The Contractor shall immediately make available manual labor or mechanical equipment capable of handling the cleaning process. During such an emergency, City forces may be called upon to complete the cleanup work, or the City may contract for the cleanup work. All construction work shall be shut down during this cleanup work by the City/contract forces. The City may shut down further construction work until the violations are corrected to the satisfaction of the City. The cost of the work performed by City/Contract forces plus an additional 70% surcharge shall be paid by the Contractor by deduction from payment due him on the contract. No compensation shall be given to the Contractor for stoppage of work.
- B. Such action by the City, however, shall not relieve the Contractor of his responsibility for any damages which may occur before, during or after such action has been taken by the City, and shall place no liability upon the City.

#### **1.08 FINAL CLEAN UP**

- A. Upon completion of the work, and before acceptance and final payment, the Contractor shall clean the project areas and remove all surplus and discarded materials, falsework, rubbish and temporary structures and restore in an acceptable manner all property, both public and private, which has been damaged during the prosecution of the work, and shall leave the improvement in a neat and presentable condition throughout the entire length of the improvement under contract to the satisfaction of the City. If the Conditions as noted above are not corrected immediately, the City may declare an emergency and take necessary action in accordance with the Emergency Cleanup Work section of this specification.

#### **1.09 CLEAN UP AND SAFETY**

- A. If the Contractor stockpiles granular material in the gutter, he must provide a minimum 4" pipe below the stockpile in the gutter to accommodate typical gutter flow. Any lumber or stockpiles on the site, not ready for immediate use, shall be free of nails or torn edges that may cause injury. Any materials stockpiled in the street and any open excavation shall have barricades equipped with operative automatic flashers placed at each end. The Contractor shall maintain a neat appearance at all times. All material removed shall be disposed of off-site in a legal manner.
- B. The Contractor must take special precautions to protect the public and City employees from bodily and property damage resulting from the work. Contractor must exercise all necessary precautions to ensure a safe execution of the work.

#### **1.10 CREEK PROTECTION [OPTIONAL]**

- A. The Contractor shall be responsible for and conduct all aspects of the work within the requirements of BMC Chapter 17.08 – PRESERVATION AND RESTORATION OF NATURAL WATERCOURSES (Creek Ordinance), and any other creek protection requirements by other agencies.
- B. Portions of Work involving a creek channel may not be permitted between October 15 through April 15 or other dates as may be stipulated in applicable permits.

- C. Any work between creek banks shall be conducted to not create conditions, which will allow erosion, and shall be fully restored to at least the same erosion resistant condition as before the Work.
- D. Complying with the requirements of creek protection shall include but not be limited to scheduling the Work around any time periods prohibiting work within creek limits, installing erosion control measures and employing appropriate BMPs for controlling erosion, monitoring, updating and modifying BMPs to meet the requirements for changing site conditions to comply with erosion control and creek protection, replanting creek banks to reestablish erosion resistance and bank stability.

#### 1.11 PROJECT SITE MAINTENANCE

- A. Water Pollution Control. The intent of these requirements is to enforce federal, state, and other local agencies' regulations that prohibit storm water pollution at construction sites. Storm drains discharge directly to creeks and the Bay without treatment, and discharge of pollutants (i.e., any substance, material, or waste other than uncontaminated storm water) into the storm drain system is strictly prohibited.
- B. The term "storm drain system" shall include storm water conduits, storm drain inlets and other storm drain structures, street gutters, channels, watercourses, creeks, lakes, and the San Francisco Bay.
- C. For the purpose of eliminating storm water pollution, the Contractor shall implement effective control measures at construction sites. There are several publications that provide guidance on selecting and implementing effective control measures known as Best Management Practices (BMPs). BMPs include schedules of activities, prohibition of specific practices, general good housekeeping practices, operational practices, pollution prevention practices, maintenance procedures and other management procedures to prevent the discharge of pollutants directly or indirectly to the storm drain system. BMPs also include the construction of some facilities that may be required to prevent, control, and abate storm water pollution. The reference publications are as follows:
  - 1. California Storm Water Best Management Practice Handbook - Industrial/Commercial
  - 2. California Storm Water Best Management Practice Handbook - Construction ActivityThese handbooks may be purchased from Blue Print Service (BPS), 1700 Jefferson St, Oakland, CA 94612.
  - 3. Manual of Standards for Erosion and Sediment Control Measures by the Association of Bay Area Governments (ABAG).
  - 4. Heavy Equipment Operation, Fresh Concrete & Mortar Application, Painting & Application of Solvents & Adhesives, Roadwork & Paving Activities, General Construction & Site Supervision, Parking Lots and Finish the Pour Right

These brochures are available at the Engineering Division, 1947 Center Street, 4th Floor, Berkeley, CA 94704.

#### 1.12 STORMWATER POLLUTION CONTROL

- A. Stormwater Pollution Control. The intent of these requirements is to comply with federal, state, and other local agencies' regulations that prohibit non-stormwater discharges to storm drain sewer systems, creeks and San Francisco Bay. Storm drain sewers discharge directly to creeks and the Bay without treatment, and discharge of pollutants (any substance, material, or waste other than rainfall derived stormwater) into the storm drain sewer system is strictly prohibited. Further, the Contractor is informed that Federally Endangered species have been identified in creeks within the City Limits. The storm drain sewer system, pollutants, and other relevant information are further defined in

Berkeley Municipal Code (BMC) Chapter 17.20 DISCHARGE OF NON-STORMWATER INTO CITY'S STORM DRAIN SYSTEM – REDUCTION OF STORMWATER POLLUTION, and the City's stormwater NPDES (National Pollutant Discharge Elimination System) Permit No. CAS612008. These documents are available upon request.

- B. Best Management Practices (BMP) and Source Control. The contractor shall use appropriate BMPs and source control techniques on the site(s) at all times, regardless of time of year or rainfall conditions, in order to prohibit the discharge of non-stormwater discharges into the storm drain sewer system, creeks, and Bay. BMPs shall be in conformance with the California Stormwater Quality Association's "Stormwater Best Management Practice Handbook", current edition.
- C. Water Pollution Control Plan (WPCP) and Coordinator. The Contractor shall prepare, submit for favorable review by the City, and implement a WPCP which shall contain at a minimum the items included in this section.
1. The Contractor shall designate an individual (to be approved by the City) available at all times of sufficient authority to halt work and implement BMPs and source control measures for the Contractor and all sub-contractors, suppliers, and other personnel that may be at the construction site(s), to prevent non-stormwater discharges from the construction site(s). This individual shall be the contact person for all matters of the project regarding non-stormwater discharges.
  2. The WPCP shall show the locations of all storm drains, storm drain pipes, creeks, creek culverts, points of entry (catch basins, inlets, outlets), and other features through which stormwater flows.
  3. The WPCP shall identify each point of entry and show how each entry point will be protected. The WPCP shall include a protocol for allowing drainage to flow properly during rainfall events WHILE STILL PREVENTING non-stormwater discharges from entering the storm drains, creeks, and Bay.
  4. The WPCP shall include descriptions and sketches of all BMPs, show locations and describe protocols for implementing and maintaining the following BMPs for but not limited to material storage, dewatering operations, bypass pumping, saw-cutting operations, pavement operations, concrete operations, grading and excavation operations, spill prevention and control, vehicle and equipment cleaning, vehicle and equipment operation and maintenance, litter control, dust control, pavement cleaning, and construction waste management.
  5. All employees, subcontractors, suppliers, and any others involved with the construction site(s) shall be trained in implementing, the importance of, and purpose of the WPCP.
  6. The WPCP shall be updated to meet changing stages of the construction site(s). Work shall not begin without the City completing its review and finding no exceptions taken on the WPCP and finding at City's sole discretion that the WPCP meets the intent and goals of the project.
  7. In addition, the Contractor shall observe the following guidelines:
    - a. Paving during wet weather:
      - i. No paving while it is raining.
      - ii. No paving of the top lift of asphalt concrete (AC) on any day that experiences  $\frac{1}{4}$ " of rain in a twenty-four period.
      - iii. No paving of bottom lift if previous seventy-two (72) hour period experienced more than  $\frac{1}{2}$ " of rain, unless directed by the City Engineer or his designee.
    - b. Store materials as required by BMPs.

- c. Cover inlets and manholes when applying asphalt, seal coat, tack coat, slurry seal, fog seal, etc., and while sawcutting, grooving, and grinding, etc.
  - d. Place drip pans or absorbent materials under equipment when not in use.
  - e. During wet weather, store paving equipment indoors or cover with tarp or other waterproof covering.
  - f. Sweep site daily to prevent sand, gravel or excess asphalt from entering or being transported by rain into the storm drain system.
  - g. Keep ample supplies of drip pans or absorbent materials on-site.
  - h. If paving involves Portland cement concrete:
    - i. Do not wash out concrete trucks into storm drains, open ditches, streets, streams, etc. The Contractor shall prevent the discharge of pollutants from concrete operations by using measures to prevent run-on and run-off pollution, properly disposing of wastes, and by implementing the following BMP's:
      - a. Store all materials in waterproof containers or under cover away from drain inlets or drainage areas.
      - b. Avoid mixing excess amounts of Portland cement materials. Dispose of any excess materials properly.
      - c. Whenever possible, perform washout of concrete trucks off-site where discharge is controlled and not permitted to discharge to the storm drain system.
    - ii. For on-site washout:
      - a. Locate washout area at least fifty (50) feet from storm drains, open ditches or other water bodies, preferably in a dirt area.
      - b. Confine run-off from this area by constructing a temporary pit or bermed area large enough for the liquid and solid waste.
    - iii. Wash out concrete wastes into the temporary pit where the concrete can set, be broken up and then disposed of properly. If the volume of water is greater than what will allow concrete to set, allow the wash water to infiltrate and/or evaporate, if possible. Remove or vacuum the remaining silt and debris from the ponding or bermed area and dispose of it properly.
    - iv. Dispose of waste water from washing of exposed aggregate to dirt area. The dirt area shall be adequate to contain all the waste water and once the waste water has infiltrated, any remaining residue must be removed.
    - v. Collect and return sweepings from exposed aggregate concrete to a stockpile or dispose of the waste in trash container.
- D. Training. Contractor is responsible for ensuring all personnel, laborers, sub-contractors, suppliers, and any other personnel that are involved with the Work are trained in the importance of preventing non-stormwater discharges. Each worker shall be trained or certified as being trained before being allowed to work. Before any work begins, the Contractor shall submit and certify under penalty of perjury a list of all workers who have been trained on the importance of pollution prevention, BMP and source control operation and maintenance, and recognize the authority of the City to stop the work in the event of a non-stormwater discharge. The training shall include as a minimum, review of the BMP and WPCP, and all BMPs (including BMP operation and maintenance) that are planned for the Work.
- E. Enforcement. The City has the authority through this contract and appropriate sections of the BMC to enforce any portions of this section. City enforcement may include but is not limited to: citations, orders to abate, bills for City cleanup costs and administration, civil suits, and criminal charges and enforcement. Enforcement action by the City does not void or suspend any enforcement actions by other agencies, and actions by the City and other agencies shall be cumulative.
- F. Submittals and Contract Time. Contractor is cautioned and advised to have appropriately trained staff with any applicable certifications prepare all submittals for Storm Water

Pollution Controls including the WPCP, and have appropriately trained staff available to meet with City staff to review the submittals. It is considered reasonable that the Contractor shall make a complete and acceptable submittal at least by the second submission. The City reserves the right to deduct monies from payments due Contractor to cover additional costs of City's and Architect/Engineer's review beyond the second submission. Illegible submittals will be rejected and returned to the Contractor.

- G. Payment. There shall be no separate pay item for complying with the provisions of this section, unless a separate pay item is provided in the bid schedule.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

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## DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 7329****CUTTING AND PATCHING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor shall be responsible for all cutting, fitting, and patching required to complete the work and to:
  - 1. Make its several parts fit together properly,
  - 2. Uncover portions of the work to provide for installation of ill-timed work,
  - 3. Remove and replace defective work,
  - 4. Remove and replace work not conforming to requirements of Contract Documents,
  - 5. Provide routine penetrations of nonstructural surfaces for installation of electrical conduit, plumbing, and ductwork,
  - 6. Remove Samples of installed work as specified for testing.

**1.02 SUBMITTALS**

- A. Submit a written request to the Architect/Engineer two weeks in advance of executing any cutting or alteration that affects the following and is not specifically indicated on the Drawings as part of the Scope of Work:
  - 1. Work of the City or any separate contractor,
  - 2. The structural value or integrity of any element of the completed building,
  - 3. The integrity or effectiveness of weather-exposed or moisture-resistant elements or systems,
  - 4. The efficiency, operational life, maintenance, and safety of operational elements,
  - 5. The visual qualities of sight-exposed elements.
- B. The request shall include:
  - 1. The necessity for cutting or alteration,
  - 2. The effect on the work of the City or any separate contractor or on the structural or weatherproof integrity of the building,
  - 3. Description of the Proposed Work:
    - a. The scope of cutting, patching, alteration, or excavation,
    - b. The trades who will execute the work,
    - c. The products proposed to be used,
    - d. The extent of refinishing to be done.
  - 4. Alternatives to cutting and patching,
  - 5. Cost proposal, when applicable,
  - 6. Written permission of any separate contractor whose work will be affected.
- C. Should conditions of the work or the schedule indicate a change of products from the original installation, submit a request for substitution per Section 00 6325 Substitution Request Form.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Comply with specifications and standards for each specific product involved.

**PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Examine existing conditions of the Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, examine the conditions affecting the installation of products or performance of the Work.
- C. Report unsatisfactory or questionable conditions to the Project Manager in writing. Do not proceed with the work until the Project Manager has provided further instructions.

**3.02 PREPARATION**

- A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work.
- B. Provide devices and methods to protect other portions of the Project from damage.
- C. Provide protection from the elements for that portion of the Project that may be exposed by cutting and patching work.

**3.03 PERFORMANCE**

- A. Execute cutting and demolition by methods that will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- C. All plumbing, mechanical, and electrical system elements shall be concealed, unless indicated otherwise.
- D. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
- E. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish the entire unit.

**END OF SECTION**

## DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 7413****PROJECT CLEANING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Maintain Project Site, surrounding areas and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
- B. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project Site clean and ready for occupancy.

**1.02 GENERAL**

- A. Conduct cleaning and disposal operation in accord with legal requirements.
  - 1. Do not burn or bury rubbish and waste materials on Project Site.
  - 2. Do not dispose of volatile wastes in storm or sanitary drains.
- B. Hazards control:
  - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
  - 2. Prevent accumulation of wastes which create hazardous conditions.
  - 3. Provide adequate ventilation during use of volatile or noxious substances.

Note: Care shall be taken that discharge of volatile or noxious exhaust shall be shielded from air intakes of hospital mechanical systems.

**1.03 MATERIALS**

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

**1.04 DUST CONTROL**

- A. Clean interior spaces prior to start of finish painting, and continue cleaning as required until painting is completed.

**1.05 DURING CONSTRUCTION**

- A. Execute cleaning daily to ensure Project Site, City's premises, adjacent and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to control dust.
- C. At reasonable intervals during progress of Work, clean Project Site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on Project Site dump containers for collection of waste materials, debris and rubbish. Hospital waste containers shall not be used for construction waste.
- E. Remove waste materials, debris and rubbish from City's premises and legally dispose of off City's property.
- F. Vacuum clean interior areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until building is ready for substantial completion or

occupancy.

- G. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials.
- H. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

**1.06 FINAL CLEANING**

- A. Employ experienced workers, or professional cleaners for final cleaning.
- B. In preparation for Substantial Completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of accessible concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed finished surfaces; polish surfaces so designated to shine finish.
- D. Repair, patch and touch up marred surfaces to specified finish, and to match adjacent surfaces.
- E. Broom clean paved surfaces.
- F. Keep Project clean until it is occupied by the City.
- G. Clean equipment and fixtures to a sanitary condition.
- H. Clean or replace, if required, filters of operating equipment.
- I. Clean Debris from roofs, gutters, downspouts and drainage systems.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

## DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 7419****CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Salvaging and recycling nonhazardous demolition and construction waste Material category.
  - 2. Recycling non-hazardous demolition and construction waste.
  - 3. Disposing of nonhazardous demolition and construction waste.
- B. Implement practices and procedures to meet the Project's environmental performance goals, which include obtaining the LEED v4 Materials and Resources prerequisite for Construction and Demolition Waste Management Planning and two points for Construction and Demolition Waste Management. Ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise LEED Requirements.
- C. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction and all other Division 1 Sections.
  - 2. Section 01 81 13 Sustainable Design Requirements
  - 3. Section 02 42 10 Structure Demolition
  - 4. Section 31 20 00 Earth Moving
  - 5. Section 31 21 00 Utility Trenching and Backfill
  - 6. Section 32 90 00 Planting

**1.03 DEFINITIONS**

- A. Alternative Daily Cover (ADC): Material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging. Generally these materials must be processed so they do not allow gaps in the exposed landfill face.
- B. Clean Waste: Nonhazardous materials left over from construction and demolition. Clean waste excludes lead and asbestos.
- C. Commingled Waste: Building waste streams that are combined on the project site and hauled away for sorting into recyclable streams. Also known as single-stream recycling.
- D. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

- E. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- F. Diverted Waste: Includes all recycled, salvaged, reused, and donated materials.
- G. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- H. Green Business Certification Inc (GBCI): Third-party credentialing and verification body that administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system.
- A. Land-Clearing Debris And Soil: Materials that are natural (e.g., rock, soil, stone, vegetation). Materials that are manmade (e.g., concrete, brick, cement) are considered construction waste even if they were on site.
- B. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- C. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- D. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. General: Develop waste management plan that results in end-of-Project rates for a minimum salvage/recycling percent by weight of total waste generated by the Work, as required by the Berkeley Municipal Code 19.37 Berkeley Green Code.
- B. Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible.
  - 1. Demolition Waste:
    - a. Asphaltic concrete paving.
    - b. Concrete.
    - c. Concrete reinforcing steel.
    - d. Brick.
    - e. Concrete masonry units.
    - f. Wood studs.
    - g. Wood joists.
    - h. Plywood and oriented strand board.
    - i. Wood paneling.
    - j. Wood trim.
    - k. Structural and miscellaneous steel.
    - l. Rough hardware.
    - m. Roofing.
    - n. Insulation.
    - o. Doors and frames.
    - p. Door hardware.
    - q. Windows.
    - r. Glazing.
    - s. Metal studs.
    - t. Gypsum board.
    - u. Acoustical tile and panels.
    - v. Carpet.
    - w. Carpet pad.
    - x. Demountable partitions.

- y. Equipment.
- z. Cabinets.
- aa. Plumbing fixtures.
- bb. Piping.
- cc. Supports and hangers.
- dd. Valves.
- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.

2. Construction Waste:

- a. Site-clearing waste.
- b. Masonry and CMU.
- c. Lumber.
- d. Wood sheet materials.
- e. Wood trim.
- f. Metals.
- g. Roofing.
- h. Insulation.
- i. Carpet and pad.
- j. Gypsum board.
- k. Piping.
- l. Electrical conduit.
- m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1. Paper.
  - 2. Cardboard.
  - 3. Boxes.
  - 4. Plastic sheet and film.
  - 5. Polystyrene packaging.
  - 6. Wood crates.
  - 7. Plastic pails.

C. LEED Requirements:

- 1. Achieve end-of-Project rates approved by GBCI for diversion of 75 percent and four material streams, minimum, by weight or volume, of total non-hazardous solid waste generated by the Work.
- 2. Achieve end-of Project rates approved by GBCI by generating no more than 2.5 pounds of construction waste per square foot of the building's floor area.

**1.05 SUBMITTALS**

- A. Waste Management Plan: Submit **3** copies of plan within **7** days of date established for the Notice to Proceed. The Plan shall include, but not be limited to, the following:
  - 1. Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion from landfill. Per the LEED prerequisite, this requirement to include five materials in the plan is greater than the number of materials required to achieve the related LEED credits.

2. Approximate a percentage of the overall project waste that these materials represent.
    - a. Alternative daily cover (ADC) does not qualify as material diverted from disposal. Include materials destined for ADC in the calculations as waste.
    - b. Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion.
  3. Specify whether materials will be site separated or commingled and describe the diversion strategies planned for the project.
  4. Provide the name and location of where the diverted materials will be taken and how the recycling facility will process the material. If on-site diversion strategies are not available, explain why.
  5. Provide the name and location of the landfill(s) and/or incinerator(s) where trash will be disposed.
  6. Provide name, title, and responsibilities of on-site Waste Management Coordinator.
- B. See Evaluations for example of Waste Reduction Progress Reports in paragraph below.
- C. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit on a monthly basis:
1. The following information to Green Halo Tracking at [www.berkeley.wastetracking.com](http://www.berkeley.wastetracking.com).
    - a. Material category.
    - b. Generation point of waste.
    - c. Total quantity of waste in tons
    - d. Quantity of waste salvaged, both estimated and actual in tons
    - e. Quantity of waste recycled, both estimated and actual in tons
    - f. Total quantity of waste recovered (salvaged plus recycled) in tons
    - g. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
  2. The following information for LEED accreditation:
    - a. Total construction and demolition waste produced by the project (by weight or volume)
    - b. Types of waste material and quantity of each material (by weight or volume)
    - c. Total waste diverted and diversion rate (percentage). The report must address ADC and other materials that are included in the calculation even if they do not count toward diversion. If multiple haulers or diversion strategies are used, compile waste management information from all sources into a single report.
    - d. Include the following records, as applicable to the project and label them to correspond with the report:
      1. Commingled waste: Provide documentation complying with one of the following requirements:
        - a. The waste-sorting facility provides a waste diversion percentage specific to the project's waste based on measurement of each component waste material. Visual inspection is not an acceptable method of evaluation for documenting this percentage.
        - b. The waste-sorting facility's average diversion rate, which must be regulated by the local or state authority and must exclude alternative daily cover (ADC).
          - i. This must be a closed system; shipping waste to another municipality to manage does not count as diverting the waste.
      2. Recycling and Processing Facility: Manifests, weight tickets, receipts, and/or invoices indicating receipt and acceptance of recyclable waste.



3. Landfill and Incinerator Disposal: Manifests, weight tickets, receipts, and/or invoices indicating receipt and acceptance landfills and/or incinerator bound waste.
  4. Reused materials: Record of estimated weight or volume of materials that are reused on-site or salvaged for reuse on other projects by subcontractors or vendors.
  5. Donated or sold materials: Receipts and estimated weight or volume for donated materials, materials sold to retailers, or other means of diversion.
- D. Waste Reduction Calculations: Before request for Substantial Completion, submit **3** copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- E. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- F. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- G. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- A. See additional submittal requirements in Section 018113 Sustainable Design Requirements, Submittals: LEED Action Plan, LEED Progress Reports, and LEED Online Documentation.

#### **1.06 QUALITY ASSURANCE**

- A. LEED accreditation in first paragraph below is desirable, but availability of personnel with this accreditation may be limited, especially among contractors' personnel.
- B. Waste Management Coordinator Qualifications: Green Building Professional. Waste management coordinator may also serve as Green Building coordinator. Experienced employee of General Contractor/Construction Manager, with a record of successful waste management coordination of Projects with similar requirement may also serve as coordinator.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Include the Construction Waste Management Plan Management Plan requirements in contract agreements with subcontractors.
- E. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01. Waste Management Service Company should conduct the meeting and Subcontractors must be present. Issue meeting minutes and copy Owner and Architect. Review methods and procedures related to waste management including, but not limited to, the following:
1. Review and discuss waste management plan including responsibilities of waste management coordinator.
  2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities
  4. Review waste management requirements for each trade.

5. Review recycling process and facilities involved in that recycling process.

#### **1.07 WASTE MANAGEMENT PLAN**

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D.

#### **PART 2 - PRODUCTS – NOT USED**

#### **PART 3 - EXECUTION**

##### **3.01 PLAN IMPLEMENTATION**

- A. General: Implement waste management plan as approved by Construction Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to all relevant sub-contractor within 3 days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and

disposal.

- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Division 01 Section "Temporary Facilities and Temporary Controls" for controlling dust and dirt, environmental protection, and noise control.

### **3.02 SALVAGING DEMOLITION WASTE**

- A. Salvaged Items for Reuse in the Work:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until installation.
  - 4. Protect items from damage during transport and storage.
  - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area.
  - 5. Protect items from damage during transport and storage.
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

### **3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL**

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following

The City of Berkeley Transfer Station  
1201 Second Streets, Berkeley, CA

- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.

1. Waste coordinator to regularly inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### **3.04 RECYCLING DEMOLITION WASTE**

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
  1. Grind asphalt to maximum [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  1. Pulverize concrete to maximum [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  1. Clean and stack undamaged, whole masonry units on wood pallets.
  2. Pulverize masonry to maximum [3/4-inch (19-mm)] [1-inch (25-mm)] [1-1/2-inch (38-mm)] [4-inch (100-mm)] size.
    - a. Crush masonry and screen to comply with requirements in Section 32 90 00 Plantings for use as mineral mulch.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
  1. Treated Wood Waste: Treated wood waste is required to be managed, stored, transported, and disposed of as hazardous waste per California State regulations. Treated wood waste is required to be transported and disposed of at a Class I hazardous waste landfill by a Hazardous Waste contractor.
- E. Metals: Separate metals by type.
  1. Structural Steel: Stack members according to size, type of member, and length.
  2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- K. Plumbing Fixtures: Separate by type and size.

- L. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- N. Lighting Fixtures: Separate lamps by type and protect from breakage.
- O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- P. Conduit: Reduce conduit to straight lengths and store by type and size.

### **3.05 RECYCLING CONSTRUCTION WASTE**

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees.
  - 1. Comply with requirements in Section 32 90 00 Plantings for use of chipped organic waste as organic mulch.
- C. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
    - a. Comply with requirements in Section 32 90 00 Plantings for use of clean sawdust as organic mulch.
  - 3. Treated Wood Waste: Treated wood waste is required to be managed, stored, transported, and disposed of as hazardous waste per California State regulations. Treated wood waste is required to be transported and disposed of at a Class I hazardous waste landfill by a Hazardous Waste contractor.
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
    - a. Comply with requirements in Section 32 90 00 Plantings for use of clean ground gypsum board as inorganic soil amendment.

### **3.06 DISPOSAL OF WASTE**

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
  - C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

**END OF SECTION**

## DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 7700****CONTRACT CLOSEOUT****PART 1 - GENERAL****1.01 SUMMARY**

A. Section describes requirements and procedures for:

1. Project cleaning.
2. Testing of equipment and systems
3. Substantial Completion
4. Final Completion
5. Close Out
6. Warranties

**1.02 SUBSTANTIAL COMPLETION**

A. Removal of Temporary Construction Facilities and Project Cleaning.

1. Prior to Substantial Completion inspection: remove temporary materials, equipment, services, and construction; clean all areas affected by the Work; clean and repair damage caused by installation or use of temporary facilities; restore permanent facilities used during construction to specified condition.

B. Equipment and Systems.

1. Prior to Substantial Completion, Contractor shall start up, run for periods prescribed by City, operate, adjust and balance all manufactured equipment and Project systems, including but not limited to, mechanical, electrical, safety, fire, and controls.
2. Demonstrate that such equipment and systems conform to contract standards and manufacturer's guarantees. Where applicable, use testing protocols specified, and if the contract is silent, then consistent with manufacturer's recommendations and industry standards.

C. Procedure for Substantial Completion

1. When Contractor considers Work or designated portion of the Work as Substantially Complete, submit written notice to City, with list of items remaining to be completed or corrected and explanation of why such items do not prevent City's beneficial use and occupancy of the Work for its intended purposes. Within reasonable time, City will inspect to determine status of completion.
2. Should City determine that Work is not Substantially Complete, City will promptly notify Contractor in writing, listing all defects and omissions. Contractor shall remedy deficiencies and send a second written notice of Substantial Completion. City will reinspect the Work. If deficiencies previously noted are not corrected on reinspection, then pay the cost of the reinspection.
3. When City concurs that Work is Substantially Complete, City will issue a written notice or certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified by City.
4. Manufactured units, equipment and systems that require startup must have been

started up and before a notice or certificate of Substantial Completion will be issued.

5. A punch list examination will be performed upon Substantial Completion. One follow-up review of punch list items for each discipline will be provided. If further Site visits are required to review punch list items due to incompleteness of the Work by Contractor, Contractor will reimburse City for costs associated with these visits.

### **1.03 FINAL COMPLETION**

#### **A. Requirements**

1. Final Completion occurs when Work meets requirements for City's Final Acceptance.

#### **B. Procedure**

1. When Contractor considers Work is Finally Complete, submit written certification that:
  - a. Contractor has inspected Work for compliance with Contract Documents, and all requirements for Final Acceptance have been met.
  - b. Except for Contractor maintenance after Final Acceptance, Work has been completed in accordance with Contract Documents and deficiencies listed with Certificate of Substantial Completion have been corrected. Equipment and systems have been tested in the presence of City, and are operative.
  - c. Project Record Documents are completed and turned over to City, and Work is complete and ready for final inspection.
2. In addition to submittals required by Contract Documents, provide submittals required by governing authorities and submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.
3. Should City determine that Work is incomplete or Defective, City promptly will so notify Contractor, in writing, listing the incomplete or Defective items. Contractor shall promptly remedy the deficiencies and notify the City when it is ready for reinspection.

#### **C. Final Adjustments of Accounts:**

1. Submit a final statement of accounting to City, showing all adjustments to the Contract Sum and complete and execute Document 00 6530 (Agreement and Release of Claims).
2. If so required, City shall prepare a final Change Order for submittal to Contractor, showing adjustments to the Contract Sum that were not previously made into a Contract Modification.

#### **D. Warranties**

1. Execute Contractor's Submittals and assemble warranty documents, and Installation, Operation, and Maintenance Manuals, executed or supplied by Subcontractors, suppliers, and manufacturers. Provide table of contents and assemble in 8½ inches by 11 inches three-ring binder with durable plastic cover, appropriately separated and organized. Assemble in Specification Section order.
2. Submit material prior to final Application for Payment. For equipment put into use with City's permission during construction, submit within 14 calendar days after first operation. For items of Work delayed materially beyond Date of Substantial Completion, provide updated Submittal within 14 calendar days after acceptance, listing date of acceptance as start of warranty period.
3. Warranty Forms: Submit drafts to Owner for approval prior to execution. Forms shall not detract from or confuse requirements or interpretations of Contract Documents. Warranty shall be countersigned by manufacturers. Where specified, warranty shall be countersigned by Subcontractors and installers.



4. Rejection of Warranties: Owner reserves right to reject unsolicited and coincidental product warranties that detract from or confuse requirements or interpretations of Contract Documents.
  5. Term of Warranties: For materials, equipment, systems, and workmanship, warranty period shall be one year minimum from date of Final Completion of entire Work except where:
    - a. Detailed Specifications for certain materials, equipment or systems require longer warranty periods.
    - b. Materials, equipment or systems are put into beneficial use of City prior to Final Completion as agreed to in writing by City.
- E. Warranty of Title:
1. No material, supplies, or equipment for Work under Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver premises, together with improvements and appurtenances constructed or placed thereon by Contractor, to City free from any claim, liens, security interest, or charges, and further agrees that neither Contractor nor any person, firm, or corporation furnishing any materials or labor for any Work covered by Contract shall have right to lien upon premises or improvement or appurtenances thereon. Nothing contained in this paragraph, however, shall defeat or impair right of persons furnishing materials or labor under bond given by Contractor for their protection or any rights under law permitting persons to look to funds due Contractor in hands of City.
- F. Turn-In. Contract Documents will not be closed out and final payment will not be made until all keys issued to Contractor during prosecution of Work and letters from property owners, pursuant to Contract Documents, are turned in to City.
- G. Release of Claims. Contract Documents will not be closed out and final payment will not be due or made until Document 00 6530 (Agreement and Release of Claims) is completed and executed by Contractor and City.
- H. Fire Inspection Coordination. Coordinate fire inspection and secure sufficient notice to City to permit convenient scheduling (if applicable).
- I. Building Inspection Coordination. Coordinate with City a final inspection for the purpose of obtaining an occupancy certificate (if applicable).

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION – NOT USED**

**END OF SECTION**

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## DIVISION 1 GENERAL REQUIREMENTS

**SECTION 01 7800****CLOSEOUT SUBMITTALS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This section specifies administrative and procedural requirements for Project Record Documents.
- B. Project Record Documents required include:
  - 1. Marked-up copies of Contract Drawings
  - 2. Marked-up copies of Shop Drawings
  - 3. Newly prepared Drawings
  - 4. Marked-up copies of Specifications, Addenda and Change Orders
  - 5. Marked-up Project Data submittals
  - 6. Record Samples
  - 7. Field records for variable and concealed conditions
  - 8. Record information on Work that is recorded only schematically
- C. Specific Project Record Documents requirements that expand requirements of this Section are included in the individual Sections of Divisions 1 through 33.
- D. General Project closeout requirements are included in Section 01 7700, "Contract Closeout."
- E. Maintenance of Documents and Samples:
  - 1. Store Project Record Documents and samples in the field office apart from Contract Documents used for construction.
  - 2. Do not permit Project Record Documents to be used for construction purposes.
  - 3. Maintain Project Record Documents in good order, and in a clean, dry, legible condition.
  - 4. Make documents and samples available at all times for inspection by Architect and Project Manager.
- F. City will provide one set of sepias and one blueline set of the construction drawings and one project manual for the Contractor's use and copying during construction.

**1.02 PROJECT RECORD DRAWINGS**

- A. Mark-up Procedure: During the construction period, maintain a set of blueline or blackline prints of Contract Drawings and Shop Drawings for Project Record Document purposes. Label each document (on first sheet or page) "PROJECT RECORD" in 2 in. high printed letters. Keep record documents current. Note: A reference by number to a Change Order, RFI, RFQ, Field Order or other such document is not acceptable as sufficient record information on any record document. Do not permanently conceal any Work until required information has been recorded.
  - 1. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to

information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:

- a. Dimensional changes to the Drawings
  - b. Revisions to details shown on the Drawings
  - c. Depths of various elements of foundation in relation to main floor level or survey datum.
  - d. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
  - e. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
  - f. Establish locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, and similar items.
  - g. Provide actual numbering of each electrical circuit.
  - h. Field changes of dimension and detail.
  - i. Revisions to routing of piping and conduits
  - j. Revisions to electrical circuitry
  - k. Actual equipment locations
  - l. Duct size and routing
  - m. Changes made by Change Order
  - n. Details not on original Contract Drawings
2. Mark completely and accurately Project Record Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
  3. Mark Project Record Drawing sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
  4. Mark important additional information which was either shown schematically or omitted from original Drawings.
  5. Note construction change directive numbers; alternate numbers; Change Order numbers and similar identification.
  6. Responsibility for Mark-up: Where feasible, the individual or entity who obtained Project Record Drawing data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on Project Record Drawings.
    - a. Accurately record information in an understandable and legible drawing technique.
    - b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.
- B. Preparation of Transparencies: Immediately prior to inspection for Certification of Substantial Completion, review completed marked-up Project Record Drawings with the Project Manager. When authorized, prepare a full set of correct transparencies of Contract Drawings and Shop Drawings.
1. Incorporate changes and additional information previously marked on print sets. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.
  2. Refer instances of uncertainty to the Project Manager for resolution.
  3. Review of Transparencies: Before copying and distributing, submit corrected

transparencies and the original marked-up prints to the Project Manager and Architect/Engineer for review.

- a. Transparencies and the original marked-up prints will be returned to the Contractor for organizing into sets, printing, binding, and final submittal.
4. Copies and Distribution: After completing the preparation of transparency Project Record Drawings, print three blue-line or black-line prints of each Drawing, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets.
  - a. Organize and bind original marked-up set of prints that were maintained during the construction period in the same manner.
  - b. Organize Project Record Drawings transparencies into sets matching the print sets. Place these sets in durable tube-type drawing containers with end caps. Mark the end cap of each container with suitable identification.
- C. Distribution of Marked up Drawings and Transparencies
  1. Submit the marked-up Project Record Drawings set, pdfs, transparencies, and five copy sets to the Project Manager for City's records.
- D. Shop Drawings and Samples: Maintain as record documents; legibly annotate Shop Drawings and Samples to record changes made after review.
- E. In addition to requirements of this Section, comply with supplemental requirements of Divisions 21 through 28 and Division 33.
  1. Divisions 21 through 28 and Division 33 of the specifications require revision studies, the preparation of large scale, detailed Layout Drawings of the work of those divisions. These Layout Drawings are not shop drawings as defined by the General Conditions, but together with shop drawing or Layout Drawings of all other affected sections are used check, coordinate and integrate the work of the various sections
  2. Include these Layout Drawings as part of the As Built Documents.
- F. In addition to the requirements of this Section, comply with the as-built requirements of the following specifications.
  1. 01 90000 General Commissioning Requirements. Provide final as-built sequence of operation (SOO) for inclusion to the final commissioning report.
  2. 21 0500 Common Work Results for Fire Suppression. Provide 3D model and as-built drawings.
  3. 26 0573 Power System Studies. Revise studies as required to reflect as-built conditions.
- G. Delete Architect/Engineer title block and seal from documents.
- H. As-Built Documents are subject to review and acceptance by the City and Architect/Engineer.
- I. Submit documents to Project Manager with final Application for payment.

### **1.03 PROJECT RECORD SPECIFICATIONS**

- A. During the construction period, maintain one copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.
  1. Mark the Project Record Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and Modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, change order work,

and information on concealed installation that would be difficult to identify or measure and record later.

- a. In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
  - b. Record the name of the manufacturer, catalog number, supplier and installer, and other information necessary to provide a record of selections made and to document coordination with Project Record Product Data submittals and maintenance manuals.
  - c. Note related Project Record Product Data, where applicable, for each principal product specified, indicate whether Project Record Product Data has been submitted in maintenance manual instead of submitted as Project Record Product Data.
2. Upon completion of mark-up, submit Project Record Specifications to the Project Manager for City's records.

#### **1.04 PROJECT RECORD PRODUCT DATA**

- A. During the construction period, maintain one copy of each Project Record Product Data submittal for Project Record Document purposes.
  1. Mark Project Record Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Project Record Product Data submitted. Include significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.
  2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  3. Note related Change Orders and mark-up of Project Record Drawings, where applicable.
  4. Upon completion of mark-up, submit a complete set of Project Record Product Data to the Project Manager for City's records.
  5. Where Project Record Product Data is required as part of maintenance manuals, submit marked-up Project Record Product Data as an insert in the manual, instead of submittal as Project Record Product Data.
  6. Each prime Contractor is responsible for mark-up and submittal of record Project Record Product Data for its own Work.
- B. Material, Equipment and Finish Data
  1. Provide data for primary materials, equipment and finishes as required under each specification section.
  2. Submit two sets prior to final inspection, bound in 8-1/2 inches by 11 inches three-ring binders with durable plastic covers; provide typewritten table of contents for each volume.
  3. Arrange by Specification division and give names, addresses, and telephone numbers of subcontractors and suppliers. List:
    - a. Trade names.
    - b. Model or type numbers.
    - c. Assembly diagrams.
    - d. Operating instructions.
    - e. Cleaning instructions.
    - f. Maintenance instructions.
    - g. Recommended spare parts.

h. Product data.

### **1.05 MISCELLANEOUS PROJECT RECORD SUBMITTALS**

- A. Refer to other Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Project Manager for City's records. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:
1. Field records on excavations and foundations
  2. Field records on underground construction and similar work
  3. Survey showing locations and elevations of underground lines
  4. Invert elevations of drainage piping
  5. Surveys establishing building lines and levels
  6. Authorized measurements utilizing unit prices or allowances
  7. Records of plant treatment
  8. Ambient and substrate condition tests
  9. Certifications received in lieu of labels on bulk products
  10. Batch mixing and bulk delivery records
  11. Testing and qualification of tradespersons
  12. Documented qualification of installation firms
  13. Load and performance testing
  14. Inspections and certifications by governing authorities
  15. Leakage and water-penetration tests
  16. Fire resistance and flame spread test results
  17. Final inspection and correction procedures

### **PART 2 - PRODUCTS – NOT USED**

### **PART 3 - EXECUTION**

#### **3.01 RECORDING**

- A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project. City may review Project Record Documents prior to each progress payment to see that the required information is being properly and faithfully recorded to assure compliance with this requirement. If Contractor has not complied with this requirement, the progress payment will be withheld until the Record Documents have been brought up to date.

#### **3.02 SUBMITTAL**

- A. At completion of Project, deliver Record Documents to Project Manager.
- B. Accompany submittal with transmittal letter containing:
1. Date
  2. Project title and number
  3. Contractor's name and address

4. Number and title of each record documents
5. Certification that each document as submitted is complete and accurate, and signature of Contractor, or his authorized representative.

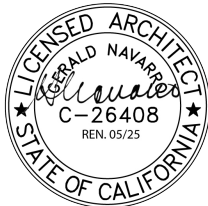
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DIVISION 2 – TECHNICAL SPECIFICATIONS

Technical Specifications Prepared By:



09/14/23

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Gerald Navarro, Principal

Date

ELS Architecture and Urban Design



09/19/2023

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Michael T. Steele

Date

BKF Engineers



09/14/23

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Karen Krolewski

Date

PGAdesign Landscape Architects



09/19/23

Stephen R. DeJesse

Date

IDA Structural Engineers, Inc.



09/14/23

Matthew Dehghani

Date

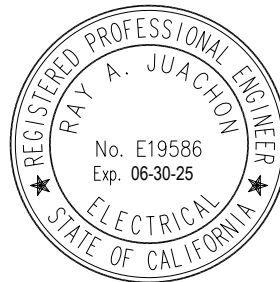
Alter Consulting Engineers

A large, stylized handwritten signature in black ink, appearing to read "Ray A. Juachon".

Ray A. Juachon

Date

RIJA Inc.



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**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

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**SECTION 01 81 13**

**SUSTAINABLE DESIGN REQUIREMENTS**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) certification based on USGBC's LEED v4 BD+C.
  - 1. Specific requirements for LEED are also included in other Sections.
  - 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
  - 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
    - a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.
  - 4. Definitions included in the "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Reference Guide and online amendments apply to this Section.
- B. Related Requirements:
  - 1. Section 01 74 19, "Construction Waste Management and Disposal."
  - 2. Section 01 81 19, "Indoor Air Quality Management."

**1.3 DEFINITIONS**

- A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using

ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.

- B. CDPH Standard Method v1.2: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.2, for the emissions testing and requirements of products and materials.
- C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.
- D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- G. Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.
  - 1. Product-Specific Declaration: A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
  - 2. Industry-Wide (Generic) EPD: Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
  - 3. Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicated recognized by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.
- I. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.

- J. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."
- K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.
- L. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.
- M. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.
- N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.
- O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.
  - 1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
  - 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.
- P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- Q. Volatile Organic Compounds (VOC) Emissions Test: Refer to CDPH Standard Method v1.2 definition.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC's final review of LEED certification.
  - 1. Provide documentation required by LEED and LEED review.
- B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.

- C. Respond to questions and requests for additional information from Architect and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.
- D. LEED Online Submittals: Upload LEED documentation submittal data directly to USGBC project "LEED Online" website. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.
- E. LEED Conference: Schedule and conduct a conference at a time convenient to Owner and Architect within 21 days prior to commencement of the work. Advise Architect and Owner's Commissioning Authority of scheduled meeting dates.
  - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
  - 3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

#### 1.5 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.
  - 1. Submit each LEED submittal simultaneously with applicable product submittal.
- B. LEED Documentation Submittals:
  - 1. General, Sustainable Materials Attributes Form: Project submittals must be accompanied by a completed Sustainable Materials Attributes Form. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the Sustainable Materials Attributes Form.
    - a. Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
  - 2. WEp3/EAp3, Building-Level Water and Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building consumption performance.
  - 3. MRp2/MRc5, Construction and Demolition Waste Management: Comply with submittal requirements of Section 01 74 19 "Construction Waste Management and Disposal."
  - 4. MRc2, Building Product Disclosure and Optimization: Option 1, Environmental Product Declarations.
    - a. Environmental product declarations complying with LEED requirements.



5. MRc2, Building Product Disclosure and Optimization: Option 2, Embodied Carbon/ LCA Optimization.
  - a. Embodied Carbon/ LCA Action Plan complying with LEED requirements.
6. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials.
  - a. Extended Producer Responsibility: Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
  - b. Bio-Based Materials: Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
  - c. Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
  - d. Materials Reuse: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
  - e. Recycled Content: Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement of costs.
7. Pilot Alternative Compliance Path – MRpc102 Legal Wood.
  - a. Certified Wood: Source Compliant certification for wood source location according to ASTM D7612-10. Product data and chain-of-custody certificate from Legal (non-controversial) Sources and Responsible Sources as defined by ASTM D7612-10. Include statement indicating cost for each certified wood product.
8. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
  - a. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting, including but not limited to the following:
    - 1) Manufacturer Inventory.
    - 2) Health Product Declaration.
    - 3) Cradle to Cradle certifications.
    - 4) Declare product labels.
    - 5) ANSI/BIFMA e3 Furniture Sustainability Standard.
9. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.

- a. Documentation for products that comply with LEED requirements for material ingredient optimization, including but not limited to the following:
  - 1) Material Ingredient Screening and Optimization Action Plan.
  - 2) GreenScreen Benchmarks.
    - a) Cradle to Cradle Bronze or higher certification level.
    - b) Declare labels designated as Red List Free or LBC Red List Free.
    - c) Health Product Declaration that meet optimization and verification criteria.
  - 3) REACH optimizations.
- 10. EQp2/EQc3/EQc4, Indoor Air Quality: Comply with submittal requirements of Section 01 57 31, "Indoor Air Quality Management."
- 11. EQc2, Low-Emitting Materials: Product data, indicating VOC content and emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:
  - a. Paints and coatings.
  - b. Adhesives and sealants.
  - c. Flooring.
  - d. Products containing composite wood or agrifiber products or wood glues.
  - e. Ceilings, walls, thermal, and acoustic insulation.
  - f. Exterior applied materials.
  - g. Furniture.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:
  - 1. Wood construction materials.
  - 2. Furniture.
  - 3. Passive plumbing materials.
  - 4. Passive mechanical (HVAC) materials.

5. Passive electrical materials.
  6. Earthwork and exterior improvements, hard costs.
- C. LEED Action Plan Components: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:
1. MRp2/MRc5, Waste management plan, complying with Section 01 74 19 "Construction Waste Management and Disposal."
  2. EQp2/EQ3/EQ4, Indoor air quality plan, complying with Section 01 57 31, "Indoor Air Quality Management."
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
1. MRp2/MRc5, Waste reduction progress reports complying with Section 01 74 19 "Construction Waste Management and Disposal."
  2. MRc2, Building product disclosure and optimization – environmental product declarations.
  3. MRc3, Building product disclosure and optimization – sourcing of raw materials and MRpc102 Legal Wood
    - a. Extended producer responsibility.
    - b. Bio-based materials.
    - c. Certified wood products
    - d. Materials reuse.
    - e. Recycled content.
  4. MRc4, Building product disclosure and optimization – material ingredients.
  5. EQc2, Low emitting materials.
    - a. Low Emitting Materials Tracking Sheet monitoring the project's progress towards targeted LEED Indoor Environmental Quality Credits. Tracking Sheet to be presented at construction meetings.
  6. EQc3, Indoor air quality, during construction, complying with Section 01 57 31, "Indoor Air Quality Management."
  7. EQc4, Indoor air quality assessment, complying with Section 01 57 31, "Indoor Air Quality Management."

## 1.7 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS, GENERAL**

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.
  - 1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.

### **2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION**

- A. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:
  - 1. Product-Specific LCA: Valued as one whole product.
  - 2. Industry-Wide (Generic) EPD: Valued as one whole product.
  - 3. Product-Specific Type III Internal EPD: Valued as one whole product.
  - 4. Product-Specific Type III External EPD: Valued as one and a half (1.5) product.
- B. A. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 2. Provide at least 5 permanently installed products (sourced from at least 3 different manufacturers) that have an embodied carbon optimization action plan compliant with LEED.
- C. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials and MRcp102 Legal Wood. Provide products that meet at least one of the responsible

extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project:

1. Extended producer responsibility program.
  2. Bio-based materials.
  3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
    - a. Rough carpentry.
    - b. Miscellaneous carpentry.
    - c. Heavy timber construction.
    - d. Wood decking.
    - e. Metal-plate-connected wood trusses.
    - f. Structural glued-laminated timber.
    - g. Finish carpentry.
    - h. Architectural woodwork.
    - i. Wood paneling.
    - j. Wood veneer wall covering.
    - k. Wood flooring.
    - l. Wood lockers.
    - m. Wood cabinets.
    - n. Furniture.
  4. Recycled content.
    - a. Exceptions: Do not include fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.
- D. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
1. Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the

chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

- a. Manufacturer Inventory.
  - b. Health Product Declarations (HPDs).
  - c. Cradle to Cradle (C2C) certifications.
  - d. Declare product labels.
  - e. ANSI/BIFMA e3 Furniture Sustainability Standard.
- E. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization. Provide at least 5 permanently installed products (sourced from at least 3 different manufacturers) that have a material ingredient screening and optimization action plan compliant with LEED.

### 2.3 LOW-EMITTING MATERIALS

- A. EQc2, Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health, (CDHP), Standard Method v1.2, using the applicable exposure scenario. Manufacturer’s documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.2 as follows:
- 1. 0.5mg/m<sup>3</sup> or less,
  - 2. between 0.5 and 5.0 mg/m<sup>3</sup> or,
  - 3. 0.50 mg/m<sup>3</sup> or more.
- B. EQc2, Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.

Product Type:	Allowable VOC Content (g/L):
Bond breakers	350
Colorant - Architectural coatings, excluding IM coatings	50
Colorant - Solvent-based IM	600
Colorant - Waterborne IM	50
Concrete - Curing compounds	100
Concrete - Curing compounds for roadways and bridges	350
Concrete surface retarder	50
Driveway sealer	50
Dry-fog coatings	50
Faux finishing coatings - Clear topcoat	100

Faux finishing coatings - Decorative coatings	350
Faux finishing coatings - Glazes	350
Faux finishing coatings - Japan	350
Faux finishing coatings - Trowel applied coatings	50
Fire-proofing coatings	150
Flats	50
Floor coatings	50
Form release compound	100
Graphic arts (sign) coatings	200
Industrial maintenance coatings	100
Industrial maintenance coatings - color indicating safety coatings	480
Industrial maintenance coatings - High temperature IM coatings	420
Industrial maintenance coatings - Non-sacrificial anti-graffiti coatings	100
Industrial maintenance coatings - Zinc-rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-Color coatings	250
Nonflat coatings	50
Pre-treatment wash primers	420
Primers, sealers, and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	100
Sacrificial anti-graffiti coatings	50
Shellac - Clear	730
Shellac - Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Stone consolidants	450
Swimming pool coatings - Repair	340
Swimming pool coatings - Other	340
Tile and stone sealers	100
Traffic coatings	100
Tub and tile refinish coatings	420
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood coatings - varnish	275
Wood coatings - sanding sealers	275
Wood coatings - lacquer	275
Wood conditioners	100
Wood preservatives	350
Low solids coatings	120

- C. EQc2, Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, 75 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard

Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- D. EQc2, Low-Emitting Materials, Adhesives and Sealants: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on October 6, 2017:

Architectural Applications:	Allowable VOC Content (g/L):
Building envelope membrane adhesive	250
Carpet pad adhesives	50
Ceramic glass, porcelain, & stone tile adhesive	65
Cove base adhesives	50
Dry wall and panel adhesives	50
Multi-purpose construction adhesives	70
Roofing- single ply roof membrane adhesive	250
Roofing- all other roof adhesives	250
Rubber floor adhesives	60
Structural glazing adhesives	100
Structural wood member adhesive	140
Subfloor adhesive	50
VCT and asphalt tile adhesives	50
Wood flooring adhesive	100
All other indoor floor covering adhesives	50
All other outdoor floor covering adhesives	50
Building envelope membrane adhesive	250
Carpet pad adhesives	50
Ceramic glass, porcelain, & stone tile adhesive	65
Cove base adhesives	50
Dry wall and panel adhesives	50
Multi-purpose construction adhesives	70
Roofing- single ply roof membrane adhesive	250
Roofing- all other roof adhesives	250
Rubber floor adhesives	60
Structural glazing adhesives	100
Structural wood member adhesive	140
Subfloor adhesive	50
VCT and asphalt tile adhesives	50
Wood flooring adhesive	100
All other indoor floor covering adhesives	50
All other outdoor floor covering adhesives	50
Specialty Applications:	Allowable VOC Content (g/L):
Computer diskette manufacturing adhesive	350
Contact adhesive	80
Edge glue adhesive	250
ABS welding cement	325
ABS to PVC transition cement	510
CPVC welding cement	490
PVC welding cement	510
All other plastic cement welding cements	100
Rubber Vulcanization Adhesive	250
Special purpose contact adhesive	250
Thin metal laminating adhesive	780



Tire tread adhesive	100
Top and trim adhesive	250
Waterproof resorcinol glue	170
All other adhesives	250
Substrate Specific Applications:	Allowable VOC Content (g/L):
Metal substrate-specific adhesives	30
Plastic foam substrate-specific adhesives	50
Porous material (except wood) substrate-specific adhesives	50
Wood substrate-specific adhesives	30
Fiberglass substrate-specific adhesives	80
Reinforced plastic composite substrate-specific adhesives	200
Sealants for Architectural Applications:	Allowable VOC Content (g/L):
Clear, paintable, and immediately water-resistant sealant	250
Foam insulation	250
Grout	250
Roadway sealant	250
Non-staining plumbing putty	250
Potable water sealant	250
Roofing - single ply roof membrane sealant	450
Roofing - all other roof sealants	300
All other architectural sealants	50
Marine deck sealant	760
All other sealants	420
Adhesive Primers:	Allowable VOC Content (g/L):
Plastic adhesive primers	550
Pressure sensitive adhesive primers	250
Traffic marking tape adhesive primers	150
Vehicle glass adhesive primers	250
All other adhesive primers	250
Sealant Primers:	Allowable VOC Content (g/L):
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
All other sealant primers	750
Other:	Allowable VOC Content (g/L):
Other adhesives, adhesive bonding primers, adhesive primers, or any other primers	250

1. Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

- E. EQc2, Low-Emitting Materials, Adhesives and Sealants: For field applications that are inside the weatherproofing system, 75 percent of adhesives and sealants shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. EQc2, Low-Emitting Materials, Flooring: 90 percent of flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for

the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- G. EQc2, Low-Emitting Materials, Composite Wood: At least 75 percent of composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
- H. EQc2, Low-Emitting Materials, Walls, Thermal, and Acoustic Insulation: At least 75 percent of walls, and insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. EQc2, Low-Emitting Materials, Ceilings: At least 90 percent of ceilings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- J. EQc2, Low-Emitting Materials, Furniture: At least 75 percent of furniture, measured by cost, shall be tested in accordance with ANSI/BIFMA Standard Method M7.1-2011; comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach; and model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate.
  - 1. Additional Low-Emitting Requirements:
    - a. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
    - b. If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
    - c. Methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

K. INDOOR WATER USE REDUCTION

- 1. WEp2, Indoor Water Use Reduction, Appliances: Provide ENERGY STAR or performance equivalent appliances.
- 2. WEp2/WEc2, Indoor Water Use Reduction, Plumbing Fixtures: Do not exceed water flow requirements indicated in Division 22 - PLUMBING.

## **PART 3 - EXECUTION**

### **3.1 NONSMOKING BUILDING**

- A. EQp2, Environmental Tobacco Smoke Control: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

- 1. Refer to Section 01 57 31, "Indoor Air Quality Management."

### **3.2 CONSTRUCTION WASTE MANAGEMENT**

- A. MRp2 MRc5, Construction and Demolition Waste Management: Comply with Section 01 74 19 "Construction Waste Management and Disposal."

### **3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT**

- A. EQc3/EQc4, Construction Indoor Air Quality Management Plan: Comply with Section 01 57 31, "Indoor Air Quality Management."

**END OF SECTION**

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**SECTION 01 81 15**

**CALGREEN ENVIRONMENTAL REQUIREMENTS**

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**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes: Comply with CALGreen environmental requirements related to energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality as adopted by the City of Berkeley.

1. Nonresidential Projects: Comply with specific CALGreen requirements for nonresidential projects:

1.2 ENVIRONMENTAL REQUIREMENTS

A. Mandatory Measures: Comply with CALGreen Mandatory Measures applicable to Project.

1. Design team and construction team are each required to participate to maximum degree possible to achieve CALGreen environmental requirements.
2. Contract Documents are not intended to limit alternative means of achieving environmental requirements.
  - a. Suggestions from Contractor, subcontractors, suppliers, and manufacturers for achieving environmental requirements are encouraged; team approach is also encouraged.
3. Voluntary Tiers: Construction team is encouraged to work with Owner and Design Team to achieve enhanced Voluntary Tier levels by incorporating additional measures as defined in CALGreen Appendixes.
  - a. Contact Owner and Architect regarding extent of intent of Project to reach Voluntary Tiers, additional work necessary to achieve enhanced Voluntary Tiers, and potential costs involved in achieving each Voluntary Tier.
  - b. Construction team is required to achieve Mandatory Measures and to achieve as much as possible without unacceptable cost impact or schedule impact as considered by Owner.

B. Requirements: Construction team is required to review CALGreen requirements relative to Nonresidential Project related to following.

1. Energy Efficiency: Comply with California Energy Commission requirements.
2. Water Efficiency and Conservation: Comply with requirements for both indoor and outdoor water use.

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3. Material Conservation and Resource Efficiency:
  - a. Nonresidential Projects: Provide weather-resistant exterior wall and foundation envelope including prevention of landscape irrigation spray on structures (if any) and prevent water intrusion at exterior entries.
  - b. Construction Waste: Provide construction waste management plan as defined by CALGreen and complying with CALGreen requirements for construction waste diverted from landfill by recycling or salvage for reuse.
  - c. Nonresidential Projects Building Maintenance and Operation: Provide for commissioning requirements as required by CALGreen including but not limited to testing, documentation, and training, testing, and adjusting.
  
4. Nonresidential Projects Environmental Quality:
  - a. Fireplaces: Comply with requirement for fireplaces (if any) to be direct-vent sealed-combustion gas type or sealed wood-burning fireplace, woodstove, or pellet stove.
  - b. Mechanical Equipment Pollution Control: Cover duct and related air distribution component openings to prevent dust and debris accumulation.
  - c. Finish Material Pollution Control: Comply with CALGreen requirements for volatile organic compound (VOC) emissions including but not necessarily limited to following (as applicable):
    - 1) Adhesives, sealants, and caulks.
    - 2) Paints and coatings.
    - 3) Resilient flooring systems.
    - 4) Composite wood products formaldehyde limitations.
  - d. Filters: Comply with requirements for mechanically ventilated buildings to have air filtration media for outside and return air prior to occupancy.
  - e. Environmental Tobacco Smoke (ETS) Control: Comply with CALGreen requirements for ETS.
  - f. Interior Moisture Control: Comply with California Building Code requirements and CALGreen requirements for vapor retarder at concrete slab foundations and capillary break (aggregate base).
  - g. Building Material Moisture Content: Do not use water damaged building materials, remove and place wet and high moisture content insulation, and do not enclose wall or floor framing when moisture content exceeds 19%.
  - h. Indoor Air Quality: Comply with CALGreen requirements for outside air delivery and carbon dioxide monitoring.

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- i. Environmental Comfort: Comply with CALGreen requirements for whole acoustical control and interior sound control.
  - j. Outdoor Air Quality: Comply with CALGreen requirements for reduction of greenhouse gases and ozone depletion.
- C. Planning and Design: Construction team shall coordinate with Design Team regarding Project Planning and Design methods related to CALGreen requirements related to Project design and shall comply with requirements related to construction.

**1.3 QUALITY ASSURANCE**

- A. Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for CALGreen issues compliance and coordination.
- 1. Experience: Environmental project manager to have experience relating to CALGreen building construction.
  - 2. Responsibilities: Carefully review Contract Documents for CALGreen issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
    - a. Submittals: Collect, compile, verify, and maintain sufficient information for submittals indicating compliance with applicable CALGreen requirements.
  - 3. Meetings: Discuss CALGreen Goals at following meetings.
    - a. Pre-construction meeting.
    - b. Pre-installation meetings.
    - c. Regularly scheduled job-site meetings.
- B. CALGreen Issues Criteria: Comply with requirements listed in CALGreen and various Specification sections.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. General Issues: Do not use materials with moisture stains or with signs of mold or mildew.
- 1. Moisture Stains: Materials that have evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediately remove from site.
  - 2. Mold and Mildew: Materials that have evidence of growth of molds or of mildew are not acceptable, including both stored and installed materials; immediately remove from site.

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**2.2 SUBSTITUTIONS**

- A. Substitutions Environmental Issues: Requests for substitutions shall comply with requirements specified in Division 01 – Substitution Procedures, with the following additional information required where environmental issues are involved.
  - 1. Indicate each proposed substitution complies with CALGreen requirements.
  - 2. Owner and Architect reserve right to reject proposed substitutions where CALGreen information is not provided and where substitution may impact mandatory requirements or Project voluntary tier requirements.

**PART 3 - EXECUTION**

**3.1 PROTECTION**

- A. Environmental Issues: Protect interior materials from water damage; where interior products not intended for wet applications are exposed to moisture, immediately remove from site.
  - 1. Protect installed products using methods that do not support growth of molds and mildews. Immediately remove from site materials with mold and materials with mildew.

**END OF SECTION**

**SECTION 01 81 19**

**CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Implement practices and procedures to meet the Project's environmental performance goals, which include obtaining the LEED v4 Indoor Environmental Quality credit Construction Indoor Air Quality Management Plan for 1 point and credit Indoor Air Quality Assessment for 1 point. Ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise LEED Requirements.
- C. This Section includes requirements for the development of a Construction Indoor Air Quality Management Plan to be implemented throughout the duration of the project construction in order to minimize the detrimental impacts on air quality resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site and poor housekeeping, shall be minimized.

**1.2 RELATED SECTIONS**

- A. Divisions 01 through 33 Sections for LEED requirements specific to the work of each of these Sections.
- B. Section 01 81 13 Sustainable Design Requirements
- C. Section 01 90 00 General Commissioning Requirements

**1.3 DEFINITIONS**

- A. A Construction IAQ Management Plan is a document specific to a building project that outlines measures to minimize contamination in the building during construction. It provides requirements to flush the building of contaminants prior to occupancy and/or testing to verify air contaminant level prior to occupancy.
- B. (MERV) = Minimum Efficiency Reporting Value.

**1.4 REFERENCE STANDARDS**



- A. ANSI/ASHRAE 52.2-2007, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size". [www.ashrae.org](http://www.ashrae.org).
- B. Sheet Metal and Air-Conditioning National Contractor Association (SMACNA), "IAQ Guidelines for Occupied Buildings under Construction", 2nd Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3) [www.smacna.org](http://www.smacna.org).
- C. U.S. Environmental Protection Agency (EPA) "Compendium of Methods for the Determination of Air Pollutants in Indoor Air" <http://nepis.epa.gov/Exe/ZyPDF.cgi/P1004G22.PDF?Dockey=P1004G22.PDF>
- D. CEN Standard EN 779: 2002, Particulate air filters for general ventilation, Determination of the Filtration Performance.
- E. Green Seal, GS-37 "Cleaning Products for Industrial and Institutional Use" [www.greenseal.org/](http://www.greenseal.org/).

## 1.5 REQUIREMENTS

### A. LEED Credit Requirements

#### 1. EQ Credit - Construction Indoor Air Quality Management Plan

- a. The Contractor shall develop an Indoor Air Quality (IAQ) Management Plan for the project.
  - 1) Meet or exceed the Control Measures of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, Chapter 3.
  - 2) Protect absorptive materials (stored or installed) from moisture damage.
  - 3) Install MERV 8 filters at all return air grilles as determined by ASHRAE 52.2-2007 if permanently installed air handlers are used during construction. Install MERV 8 filters in all air handling units if permanently installed air handlers are used during construction.
  - 4) Immediately before occupancy, replace all filtration media with the final design filtration media, installed in accordance with the manufacturer's recommendations.
  - 5) Prohibit the use of tobacco products inside the building and within 25 feet (8 meters) of the building entrance during construction.

## 1.6 SUBMITTALS

### A. LEED Documentation Submittals

#### 1. EQ Credit - Construction Indoor Air Quality Management Plan

- a. Indoor Air Quality Management Plan: Within thirty (30) days after receipt of Notice to Proceed, the Contractor shall develop and submit to the Owner for

review an indoor air quality management plan. The Plan shall include, but not be limited to, the following:

b. Address each of the five categories (including subsections) covered by the SMACNA "IAQ Guidelines for Occupied Buildings under Construction" as follows:

1) HVAC Protection

- a) Permanently installed HVAC equipment
- b) Duct protection and cleaning
- c) Filtration media
- d) Material storage

2) Source Control

- a) Allowed products
- b) Product substitution
- c) High-toxicity material protocols
- d) Local and temporary exhaust
- e) Air cleaning
- f) Smoking
- g) Moisture protection
- h) Sealing sources of pollution

3) Pathway Interruption

- a) Isolate work area
- b) Depressurize work area, pressurize occupied or completed space
- c) Relocate pollutant sources
- d) Entryway walk-off mats
- e) Dust guards and collectors on tools

4) Housekeeping

- a) Maintenance of site
- b) Vacuum filters
- c) Dust control for sweeping

- d) Final cleaning of site
  - 5) Scheduling
    - a) Sequencing of trades and material installation
    - b) If applicable, flush-out and/or perform IAQ testing
    - c) Filtration media
  - c. Procedures for protecting stored on-site or installed absorptive materials from moisture damage.
  - d. Description of the smoking policy for the project site during construction. Refer to Section 01 81 13 Sustainable Design Requirements.
  - e. Indicate whether air handlers will be operated during construction, and specify filtration procedures for permanent equipment that will be used.
  - f. Schedule for inspection and maintenance of IAQ measures.
  - g. Include provisions in the Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order or rectify non-compliant conditions.
  - h. Incorporate procedures for the flush-out and/or air quality testing into the IAQ Management Plan, as specified below.
  - i. If permanently installed HVAC systems are used for heating, cooling or ventilation during construction, provide the following:
    - 1) Product data sheet for temporary filtration media, including the filtration rating.
    - 2) Log identifying installation date of temporary filtration media, dates that filtration media was inspected and dates for when permanent filters were installed.
  - j. Product data for permanent filtration media installed prior to occupancy.
  - k. Provide a copy or photograph of "No Smoking" signs posted around the job site.
2. EQ credit - Indoor Air Quality Assessment
- a. Flush Out: Signed statement describing the building air flush-out procedures, including:
    - 1) Dates when flush-out was begun and completed
    - 2) Outdoor air delivery rates
    - 3) Internal temperature.

- 4) Relative humidity
  - 5) Confirmation that all interior finishes, movable furnishings, and major VOC punch list items were installed and complete before beginning the flush-out
  - 6) Confirmation that new filtration media were installed before the flush-out began
- B. LEED Progress Reports: Submit a monthly report containing photographs of each IAQ measure implemented. At minimum, include 6 photographs monthly.
1. By the end of construction, at least 3 photographs over the course of construction of each IAQ measure implemented must be included in the report.
  2. Include photographs that demonstrate methods employed to protect absorptive materials from moisture damage during construction and pre-occupancy. Highlight materials stored or installed on-site.
  3. Photographs should be annotated to indicate the IAQ measure depicted and the general location of the photograph.
- C. See additional submittal requirements in Section 018113 Sustainable Design Requirements, Submittals: LEED Action Plan, LEED Progress Reports, and LEED Online Documentation.

## 1.7 QUALITY ASSURANCE

- A. Construction IAQ Representative: The General Contractor/Construction Manager shall designate an individual as their Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner, Architect and LEED Consultant on regular basis, and for assembling the required green building documentation.
- B. Include the IAQ Management Plan requirements in contract agreements with subcontractors.
- C. As subcontractors are selected and deployed on site, familiarize them with the plan and how it will affect their daily activities. Hold a subcontractors' orientation meeting to review the plan requirements as a group.
- D. Include construction IAQ progress check-ins as a regular item in weekly subcontractor meetings and safety meetings.
- E. Provide a copy of the plan on site, posted in an accessible area. Translate the plan into the languages spoken by subcontractors and their crews.
- F. Verify that the IAQ management plan is being followed on job walks.

## PART 2 – PRODUCTS

### 2.1 CLEANING

- A. Using low-toxic cleaning supplies for cleaning of surfaces, equipment, and personal use complying with GS-37 or other equivalent standard.
- B. GS-37 tested and approved cleaning products can be found on their website:
- C. <http://www.greenseal.org/FindGreenSealProductsandServices.aspx?vid=ViewProductDetail&cid=0&sid=23>

## 2.2 FILTRATION MEDIA

- A. If permanently installed air handlers are used during construction, temporary filtration media must meet one of the following performance criteria:
  - 1. MERV of at least 8, as determined by ASHRAE 52.2-2007 (with errata but without addenda)
  - 2. Class F5 or higher, as defined by CEN Standard EN 779-2002, Particulate Air Filters For General Ventilation, Determination of the filtration performance

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The General Contractor/Construction Manager shall be responsible for implementation of the Construction IAQ Management Plan, and for the coordination of the Plan with all affected trades. Sub-contractors shall be responsible for the implementation of specific control measures, as impacted by their trade. Subcontractors shall coordinate their responsibilities through the Construction Manager and their designated Construction IAQ Representative.
- B. Temporary filtration media must be used at each return air grille if permanently installed air handlers are used during construction.
  - 1. After completion of construction and prior to occupancy, temporary filtration media must be replaced with new permanent filters as specified.

### 3.2 FLUSH OUT

- A. After construction ends – including the installation of all interior finishes and movable furnishings, major VOC punch list items have been completed, and the building has been thoroughly cleaned – but prior to occupancy, install new filtration media and supply a total air volume of 14,000 cubic feet of outdoor air per sf of gross floor area. Maintain internally 60 degrees F and no higher than 80 degrees F and maximum 60% RH within the building during the flush out procedure.
  - 1. Permanent filters used during the flush-out shall meet the requirements of the filtration media specified for this project.
- B. If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of gross floor area to the space. Maintain internally 60 degrees F and no higher than 80 degrees F and maximum 60% RH within the building. Once the space is

occupied, it shall be ventilated at a minimum rate of 0.3 cfm/sf of outside air or the design minimum outside air rate determined in EQ Prerequisite Minimum Indoor Air Quality Performance, whichever is greater. Each day of the flush out, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cubic feet per square foot of outside air has been delivered to the space.

### 3.4 INSPECTIONS & PROCEDURES

- A. Conduct regular inspection and maintenance of indoor air quality measures.
- B. Implement policies and procedures outlined in the Indoor Air Quality Management Plan.
- C. Use safety meetings, signage, and subcontractor agreements to communicate the goals of the Indoor Air Quality Management Plan.

END OF SECTION 01 81 19

## APPENDIX A – SAMPLE IAQ CONSTRUCTION PLAN

1.1 The following plan is an outline only and should be edited to reflect the unique requirements of the project. The plan is meant to address the requirements for LEED™ IEQc3 – Construction IAQ Management Plan

- A. **SMACNA IAQ Requirements:** During construction the Contractor shall meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Design/Builders Association (SMACNA), IAQ Guidelines for Occupied Buildings Under Construction, 2nd edition, 2007, Chapter 3, for the items listed below:

#### 1. HVAC Protection:

- a. Protect all air handling and distribution equipment, and air supply and return ducting during construction.
- b. Adequately cover and protect all exposed air inlets and outlets openings, grilles, ducts, plenums, etc. to prevent water, moisture, dust, and other contaminate intrusion.
- c. Apply protection immediately after installation of equipment and ducting.
- d. Ducting runs that require more than a single day to install shall be protected at the end of each day's Work.
- e. All air handlers used during construction should have a MERV 8 filter. In addition, return ducts of all air handlers used during construction should be fitted with MERV 8 filters.

#### 2. Source Control:

- a. Protect stored on-site or installed absorptive or porous materials such as batt insulation and drywall from exposure to moisture.
  - b. Do not use wet damaged porous materials in the building.
  - c. Provide adequate ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree F maximum continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise approved by Architect.
  - d. Route material deliveries and construction waste removal around the exterior of the building, not through it.
3. **Pathway Interruption:**
- a. The Owner does not plan to occupy the building until construction is complete.
4. **Housekeeping:**
- a. Minimize accumulation of dust fumes, vapors, or gases in the building.
  - b. Suppress dust with wetting agents or sweeping compounds.
  - c. Clean-up dust using a wet rag or damp mop.
  - d. Increase the cleaning frequency when dust build-up is noted.
  - e. Remove spills or excess applications of solvent-containing products as soon as possible.
  - f. Remove accumulated water and keep work areas as dry as possible.
  - g. Vacuum using HEPA filtered vacuum cleaners.
  - h. Store volatile liquids, including fuels and solvents, in closed containers and outside of the building when not in use.
  - i. Keep volatile liquid containers closed when the container is inside of the building and not in use.
5. **Scheduling:**
- a. Schedule for application of interior finishes including timeframes for the application of wet materials onto dry materials, dry materials onto wet materials, and expected curing times for applied wet materials.
  - b. Wet materials include all paints, adhesives, sealants, coatings, finishes and spray-applied materials, such as structural fireproofing.

- c. Insure that all wet applied interior finish materials are properly and fully cured before installing other finish materials over them.
- d. Install carpets and furnishings after all other interior finish materials have been applied and fully cured.
- e. Provide sufficient ventilation, air circulation and air changes to properly cure materials.
- f. Provide sufficient ventilation, air circulation and air changes to dissipate excess humidity when present.

**END OF SECTION**



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**SECTION 01 90 00**

**GENERAL COMMISSIONING REQUIREMENTS**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Division 01 Sections for Closeout Procedures, Operation and Maintenance Data, Demonstration and Training.
- B. Division 22 Plumbing
- C. Division 23 Heating, Ventilating, and Air Conditioning, and Automation
- D. Division 26 Electrical

1.2 SECTION SUMMARY

- A. Provide the work of this Section in accordance with requirements of the Contract Document.
- B. This section provides general requirements that apply to the implementation of commissioning without regard to specific systems or components.
- C. Commissioning is the systematic process to provide documented confirmation that building systems perform according to the criteria set forth in the design documentation, Owner's Project Requirements, and to satisfy the owner's/facilities needs with a focus on energy efficiency as well as operation and maintenance needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system verification, testing and balancing, functional performance testing and training.
- D. All commissioning activities that take place on the project must adhere to the requirements of this specification and as a minimum requirement meet the following reference standards:
  - 1. ASHRAE Guideline 0 The Commissioning Process
  - 2. ASHRAE 1.1 HVAC&R Technical Requirements for the Commissioning Process
  - 3. ASHRAE 202 Commissioning Process for Buildings and Systems
  - 4. USGBC LEED v4 Fundamental Commissioning
  - 5. USGBC LEED v4 Enhanced Commissioning

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6. 2022 California Energy Code Title 24 Part 6; Section 120.8 Commissioning Requirements
7. 2022 Nonresidential California Green Building Standards Code (CALGreen 2019)

E. Abbreviations:

1. A/E Architect/Engineer
2. AMBCx Automated Monitoring Based Commissioning Systems
3. AHJ Authorities having Jurisdiction
4. BOD Basis of Design
5. CC Controls Contractor
6. CM Construction Manager or Project Manager, not Contractor team
7. CMAT Control Monitoring Alarm Trending Table
8. Cx Commissioning
9. CxA Commissioning Agent/Authority
10. EC Electrical Contractor
11. EMCS Energy Management Control System
12. FM Facility Manager
13. FPT Functional Performance Test/Testing
14. GC General Contractor
15. IVC Installation and Verification Checklist
16. MC Mechanical Contractor
17. MEP Mechanical, Electrical, Plumbing
18. OPR Owner's Project Requirements
19. PM Project Manager
20. Subs Subcontractor
21. TAB Test & Balance Contractor

F. Definitions

1. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, and supporting information.

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2. Basis of Design (BOD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of proposed systems that support the design process.
3. Commissioning Plan (Cx Plan): The commissioning plan is the roadmap for all activities related to commissioning. Commissioning begins during early design and continues through construction and into the post-occupancy period; therefore, this document is intended to provide requirements for both design and construction teams. A preliminary Cx Plan is developed during the early design phase and updated by the CxA as needed throughout the process.
4. Installation Verification Checklists (IVC): A list of items to inspect and simple component tests to conduct in an effort to verify proper installation of equipment, provided by the CxA to the installing contractors for completion.
5. Issues Log: A document developed and maintained by the CxA that is used to track, update, and verify resolution of all issues or deficiencies identified during the commissioning process.
6. FPT Readiness Form: A simple document developed by the CxA for each system as a way for the construction team to notify the CxA that a system is ready for FPT. This can be a simple sign-off sheet with trade (MC, EC, CC, etc.), item (Startup Complete, TAB Complete, etc.), date, and signature lines and will be the single document used by the contractors to sign-off that the system has been pre-tested and verified to be ready for functional performance testing by the CxA.
7. Functional Performance Test (FPT): This is an equipment /system specific testing document developed by the CxA that is based on the approved sequence of operations documentation to fully test equipment and systems in various (all) modes of operation. Final operating set points and parameters are documented within, as well as any operational or functional notes, or recommendations that were discovered during functional performance testing.

### 1.3 SYSTEMS TO BE COMMISSIONED

- A. The following systems shall be commissioned:
  1. Heating, Ventilation, Air Conditioning Systems:
    - a. Air Source Heat Pump
    - b. Radiant System
    - c. Hydronic pumps
    - d. Air Handling Systems

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- e. Air Distribution Systems including terminal units
- f. Coils
- g. Ventilators
- h. Packaged HVAC equipment
- i. Outside Air Ventilation Systems
- j. Toilet & other Exhaust Systems
- k. Building Automation System (BAS) Controls

2. Plumbing/Civil

- a. Domestic Hot Water Systems and Controls
- b. Irrigation System

3. Electrical

- a. Electrical Incoming Power Services
- b. Normal Power Distribution System
- c. Indoor Lighting and Lighting Controls System
- d. Photovoltaic System

3.2 RESPONSIBILITIES – ARCHITECT/ENGINEERING TEAM (A/E)

- A. May be requested to assist the owner with the development of the Owner's Project Requirements (OPR)
- B. Respond to design review comments provided by the CxA to clarify questions and discrepancies.
- C. Develop and update the BOD, based on changes or updates to the OPR or design.
- D. Communicate and provide clarification to CxA and contractors as to the operational intent for proper and efficient equipment functioning and integration of systems within the building.
- E. Assist with resolution and clarification of equipment and systems' Sequence of Operations or design intent during design and construction phases.

3.3 RESPONSIBILITIES – GENERAL CONTRACTOR (GC)

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- A. The contractor shall assign a representative (CxC) with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to:
1. Review and evaluate the CxA site visit reports and issues logs in collaboration with the responsible party for the equipment and system and recommend corrective action in a timely manner. Notify the CxA of this corrective action as well as when corrective action has been complete.
  2. Cooperate with the CxA for resolution of issues noted in the issues log.
  3. Attend commissioning meeting as required.
  4. Integrate and coordinate necessary commissioning process activities with the master schedule.
  5. Delegate commissioning tasks to the subcontractors.
  6. Provide manufacturer manuals and other supporting documentation described in other sections necessary for the CxA to develop the functional performance tests.
  7. Review, comment, and accept the commissioning FPTs provided by the CxA.
  8. Witness the functional performance testing, and assist (as necessary) with the resolution of any issues noted during this testing.
  9. Coordinate the training of the facilities management team, provide dates and times of training to the facilities team and to the CxA.
  10. Provide a list of all equipment, locations, services, setpoints, and operating parameters to the CxA for inclusion in the final commissioning report. This shall be provided to the facilities team as part of the turnover documentation.
  11. Review, comment and follow the commissioning plan as developed and provided by CxA.
  12. Attend post occupancy review approximately 10 months after building turnover.
  13. Assist in resolving any warranty issues raised during the post occupancy review.

**3.4 RESPONSIBILITIES – SUB-CONTRACTORS**

- A. Contractor shall assign representative with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to the following:
1. Provide all requested submittal data including detailed startup and/or testing procedures as requested by the CxA.
  2. Review, comment, and follow the final Cx Plan as provided by the CxA.

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3. Assist in equipment/systems testing as necessary.
4. Provide all specialty tools and instruments (specific to a piece of equipment/system) as required for testing equipment/systems and shall be turned over to the facilities management team upon project completion. Any stand-alone data logging equipment necessary for the commissioning process shall be provided by the CxA and shall not be turned over once testing is complete.
5. Provide appropriate information and documentation as requested by the CxA regarding equipment operation, functionality, sequence of operations, and testing procedures.
6. Review, comment, and accept the commissioning FPTs provided by the CxA.
7. Review and complete the installation verification checklists provided by the CxA. Complete the checklists and submit to the CxA along with the Pre-FPT Readiness forms as a statement to the CxA that the equipment/systems have been installed, set-up, balanced (TAB), DDC point-to-point complete, pretested, and are fully ready for FPT.
8. Complete startup and manufacturer required checklists. Provide a copy of completed forms to the CxA.
9. Perform a dry run of the approved FPT prior to the CxA witnessing.
10. Provide remote access to the Building Automation System.
11. Witness the functional performance testing and assist (as necessary) with the resolution of any issues noted during this testing.
12. Provide final as-built sequence of operation (SOO) for inclusion to the final commissioning report.
13. Assist with any seasonal or deferred functional performance testing. Include a separate line item in budget for this activity.
14. Attend commissioning meetings as required by the project requirements.

**3.5 RESPONSIBILITIES – COMMISSIONING AUTHORITY (CXA)**

- A. The CxA is not responsible for design concept, design criteria, code compliance, design or general construction scheduling, cost estimating or construction management. The CxA shall assist with problem-solving, but ultimately the responsibility resides with the GC and/or A/E team. The primary role of the CxA is to develop and coordinate the execution of the Cx Plan, observe and document design intent and contract documents. The contractors shall provide all the tools or the use of tools to start, check-out, pre-test, and functionally test equipment and systems.
  1. CxA shall report directly to owner/facilities as well as the Construction Manager/Project Manager. The CxA shall coordinate all commissioning activities with GC as well.

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2. Coordinate and directs the commissioning activities using consistency, forms, documentation, clear and regular communications, consultations, timelines, schedules, and technical expertise.
3. Coordinates the commissioning work and with assistance from the GC, ensure that commissioning activities are being schedule into the master construction schedule.
4. Develop and update the Cx Plan.
5. Plan and conduct the commissioning kick-off meeting and other commissioning meetings as necessary.
6. The CxA shall lead all commissioning meetings.
7. Request and review additional documentation and/or information required to perform the commissioning tasks, startup documentation, installation verification, testing documentation, point-to-point, test and balance reports, O&M Manuals, and other relevant documentation.
8. Gather and review the current control sequence of operations, system interlocks, etc. and work with the contractors and engineers until sufficient clarity has been obtained to be able to write detailed FPTs.
9. The CxA shall review normal contractor submittals as applicable to systems being commissioned for compliance with commissioning needs, and/or, to assist with understanding the equipment/system operation sufficiently so as to develop and accurate FPT.
10. Write and distribute installation verification checklists to the contractor.
11. The CxA may work with the subs in developing startup plans if scope of work permits and commissioning team determines this is beneficial to the overall success of the project.
12. Perform site visits to observe component and system installations including, but not limited to, equipment protection during course of construction, major equipment startup, load testing, simulated testing, equipment serviceability, installation workmanship, etc.
13. The CxA shall submit regular site visit reports for each site visit to the contract holder, facilities, and the GC for distribution to the appropriate subs.
14. The CxA shall regularly communicate with all members of the commissioning team, keeping them apprised of the commissioning progress and scheduling changes through emails, phone calls, site visit reports, etc.
15. The CxA shall update and submit the master commissioning log weekly at minimum. This shall include any updates, changes in status and discussion notes, etc., since last update was submitted.
16. Attend select planning and job-site meeting to obtain necessary information on scheduling and overall construction progress.

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17. Assist the team with resolving any issues noted that may directly or indirectly affect commissioning progress.
18. Witness all or part of HVAC piping tests and flushing procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in the final commissioning report. Document any issues noted in the site visit reports as well as the master issues log.
19. Witness all or part of HVAC ductwork tests and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in the final commissioning report. Document any issues noted in the site visit reports as well as the master issues log.
20. Review and approve installation verification checklists as completed by the installing contractor. Validate information by selected site observation and spot checking.
21. Approve equipment/system startup by reviewing startup reports and by selected site observation.
22. Review TAB execution plan for completeness and thoroughness of the plan.
23. TAB Verification: CxA may request to witness TAB contractor spot check balancing of air and water systems for up to approximately 10% of the equipment. If substantial deficiencies are noted, the CxA may request verification of an additional sample of equipment. Any fee associated with this added verification may be negotiated with the contract holder but ultimately should be negotiated with the GC.
24. With necessary documentation, assistance and review from the installing contractors and A/E team, write the functional performance test procedures for equipment and systems within the commissioning scope of work. This may include control system trending, stand-alone data logger monitoring, and manual functional performance testing.
25. Functional Performance Test (FPT) development shall meet these criteria at a minimum:
  - a. Test Identification: Generic name of specific control strategy with description of the sequence of operations.
  - b. Prerequisites: List any conditions and/or requirements that must be in place in order to successfully complete the test. (i.e., Outside Air Temperature > 50degF)
  - c. Procedure/Instruction-Identify each step to ensure the testing protocol is adequate for both pre-testing as well as final 3<sup>rd</sup> party commissioning verification.
  - d. Equipment Required: As applicable.



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- e. Acceptance Criteria: Explanation of what each component/system is expected to be doing during each stage in testing. (A general statement may not be suitable for most sequences.)
  - f. Date(s) individual test was conducted.
26. The FPT shall be written with adequate instruction so that a person unfamiliar with the system can navigate through the test and expect the same outlined results. This will also help to ensure that the pretesting (by contractor) is adequate enough to ensure the system is prepared for the 3<sup>rd</sup> party verification.
  27. The FPT shall be prepared as such to verify operation and functionality in all feasible modes of operation and shall include all safeties.
  28. Coordinate, witness, and approve all functional performance tests performed by the installing contractors, directed by the CxA. Coordinate retesting as necessary until satisfactory performance is achieved.
  29. Analyze performance trend logs and monitoring data to verify performance. Any issues identified shall be added to the issue log. Document findings in the commissioning report.
  30. The CxA shall regularly communicate with all members of the commissioning team, keeping them apprised of the commissioning progress and scheduling changes through emails, phone calls, site visit reports, etc.
  31. The CxA shall maintain a masters issue log. CxA shall update and submit the master commissioning log weekly at minimum. This shall include any updates, changes in status and discussion notes, etc. since last update was submitted.
  32. Witness all or part of the training of the facility management team. Interview the trainees after training to see whether they feel the training was adequate. The CxA to assist with training information on the operation and functionality of equipment/systems as necessary to help the trainees understand the equipment/systems.
  33. Document the training and include in final commissioning report.
  34. CxA shall prepare a final commissioning report and submit it at the completion of commissioning. This shall be submitted to facilities and owner in electronic format (PDF with bookmarks preferred). All documentation gathered, prepared and complemented shall be included in the final commissioning report.
  35. Review and approve the Operation and Maintenance (O&M) manuals.
  36. Review and approve the Mechanical, Electrical, Plumbing, and Fire protection system as-builts.
  37. Coordinate and direct any required seasonal or deferred testing and issues verification.

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**PART 2 - PRODUCTS**

**2.1 TEST EQUIPMENT**

- A. Contractor shall provide all testing equipment, tools, and instruments required by the commissioning process (pre-functional and functional tests) except data logging equipment. If needed, data logging equipment is provided by the CxA. Contractor shall be responsible for all temporary materials (e.g., extension cords, jumper wires, portable sensors, etc.).
- B. Submit to CxA a list of test equipment, serial numbers, and calibration certificates expected to be used in the testing process. Calibration certificates shall be dated within 12 months of when equipment is expected to be used or as more restrictive specifications may state in the Contract Documents.
- C. The contractor shall provide a list of all test equipment required for testing to the CxA at least 45 days before testing is scheduled to begin.
- D. The test equipment shall have an accuracy appropriate to demonstrate the performance required by the Contract Documents. If not otherwise specified, the following minimum requirements apply:
  - 1. Temperature sensors and digital thermometers:
    - a. 0.5 degree F and a resolution to +/- 0.1 degree F.
  - 2. Pressure sensors:
    - a. +/- 2.0 percent of the value range being measured (not full range of meter).
  - 3. Electrical multimeters:
    - a. At least as accurate as the sensor being tested.

**PART 3 - EXECUTION**

**3.1 COMMISSIONING PLAN**

- A. The Commissioning Plan (Cx Plan) provides guidance in the execution of the commissioning process. After the initial commissioning kick-off meeting the CxA will update the Cx Plan which is then considered the "final" Cx Plan, though it may continue to evolve and expand as the project progresses. The approved construction documents take precedence over the Cx Plan.

**3.2 MEETINGS**

- A. Construction Commissioning Kick-Off Meeting: A commissioning meeting led by the CxA, shall be held within sixty (60) working days after the Notice to Proceed.

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Attendance is mandatory for the construction commissioning Team. The Cx Plan shall be presented at this meeting.

- B. Controls Integration Meeting: The CxA, CxC, Engineer of Record, CC, and Owner or Facility representative shall conduct controls integration meeting(s) in coordination with team members as appropriate, including the controls programmer for the project. The meetings shall occur after the software and database drawings are issued for initial review, but prior to the development of database and code for any piece of equipment.
- B. Other Meetings: The CxA shall schedule and lead other Cx meetings, generally in conjunction with regularly scheduled site meetings. Meetings shall cover coordination, deficiency resolution, and planning issues.

### **3.3 SUBMITTALS AND DOCUMENTATION**

- A. Equipment Submittal: Specific equipment submittals outlined in the specifications shall be provided to the CxA for review and comment.
- B. The following contractor-provided documents are required within 30 days of the approved Equipment Submittal.
  - 1. System Control Diagram (P&IDs), Sequence of Operations (SOO) and narrative description of all control sequences for each component, equipment and system.
  - 2. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include points lists for integration equipment identifying which points are read-only or writable.
  - 3. Single Line Diagram: Provide a single line diagram showing equipment and its interconnected relationship with other equipment.
  - 4. Manufacturer's Installation and Operations Manual (IOM).
    - a. Provide digital copy of the manufacturer's IOM for each unique type of equipment. This manual shall be consistent with specified approved model. Highlight or cross out sections to illustrate options and/or controls that are not being used for this project.
  - 5. Startup Checklist shall be provided for each piece of equipment as appropriate. When applicable include any manufacturer's recommended checklist as part of the contractor's developed checklist.
  - 6. Test & Balance (TAB) Submittal: Submit a sample TAB report form for each component, piece of equipment, subsystem, and system requiring testing, adjusting and balancing.
    - a. Provide a detailed description of the Test & Balance procedures and processes.

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**3.4 SITE INSPECTIONS**

- A. Relevant subcontractors shall accompany the Commissioning Authority on construction site visits prior to functional performance testing.
- C. The contractor shall correct deficiencies found during site visit within 7 days of receiving a corrective action report. A contractor's written response shall be provided with an explanation describing the corrective measure.

**3.5 STARTUP PROCEDURES**

- A. Undertake a full startup checkout of each piece of equipment. The startup testing shall be successfully completed prior to formal functional performance Testing of that system.
- D. Each piece of equipment receives a full checkout by the contractor. No sampling strategies are used.
- E. The CxA may work with the subs in developing startup plans if scope of work permits and the commissioning team determines this is beneficial to the overall project.
- F. Execution of installation verification and startup checklist.
  - 1. The CxA prepares the IVC's (Installation Verification Checklists) that are project and equipment specific.
  - 2. A minimum of 10 days prior to startup, the subcontractors and/or vendors shall schedule startup with the CxC and notify the CxA. The startup and initial checkout are directed and executed by the Subcontractor or vendor.
  - 3. The CxA, shall observe a 30% to 50% of such activities to verify proper procedures are being used and that proper documentation is being completed.
  - 4. To document the of startup, the site technician performing the task initials and dates each line item in the installation verification, startup checklists, and any manufacturer field startup sheets, as they are completed. Only individuals having direct knowledge of a line item being completed shall check or initial the forms. Each form is to be dated and signed by the person responsible for the startup.
  - 5. The Subs and/or vendors submit a signed copy of the completed checklists to the CxA for review.
  - 6. Installation verification and startup checklists may contain tasks for multiple subcontractors. The primary subcontractor for any particular commissioned equipment is responsible for coordinating sign-off by others.
  - 7. The subcontractors shall submit the completed documentation to the CxA at least 10 days prior to any TAB or FPT being scheduled.

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8. The CxA shall verify that the appropriate steps and procedures were completed prior to scheduling FPT.

**3.6 TEST & BALANCE REQUIREMENTS**

- A. Test & Balance (TAB) work is to start after all Installation verification and startup checklists are completed and accepted by CxA. Exceptions may be made if approved by CxA in advance of scheduled TAB.
- G. Notify CxA 10 days prior to scheduled TAB work.
- H. Submit working copy of TAB report to CxA for review as soon as completed and prior to FPTs.
- I. Acceptance of TAB report is based on specified deviation from design values. Deviation of  $\pm 10\%$  from design value will be used absent of specified values from design engineers.
- J. A sample set of readings will be taken during functional performance tests to verify final TAB report. The CxA may reject the TAB report if significant discrepancies for the sampled equipment are identified.

**3.7 FUNCTIONAL PERFORMANCE TESTING**

- A. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and approved construction documents (drawings, specifications, sequence of operations, etc.). Functional performance testing facilitates bringing the equipment/systems from a state of substantial completion to full dynamic operation and functionality. Additionally, during the testing process, areas of deficient, ineffective, inefficient performance are identified, documented, and corrected. Improving the overall operation and functionality of the systems.
- K. The CxA shall develop equipment/system specific functional performance tests based on approved sequence of operations documentation. This test shall fully test equipment and systems in various (all) modes of operation as well as document all set points and operating parameters. This document shall also include any operational or functional notes that were taken during functional performance testing. The FPT shall include all modes of operation called for in the approved sequence of operations and shall include the graphic point, alarm, trend, etc.
- L. In general, each system should be tested through all modes of operation (unoccupied, occupied, warm-up, cool-down, full load, seasonal, failure, etc.) where there is a specific specified response. Verifying each sequence in the approved sequence of operations is required. Proper responses to each mode and condition (power failure, freeze condition, low/high pressures, no flow, equipment failure, etc.) shall be tested and verified.

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- M. The CxA shall submit the draft FPTs to all appropriate parties (installing contractor, CC, GC, facilities, etc.) prior to scheduling functional performance testing who shall review the test for feasibility, safety, equipment and warranty protection. Allow ample time for the installing contractor to review the test and perform pre-testing as required prior to the scheduled functional performance testing.
- N. Prior to executing the FPT the following must be complete:
1. Provide CxA a minimum of 14-day notice prior to scheduling the functional performance testing.
  2. Review by CxA of the installation verification and startup checklists, and TAB Report.
  3. Correction of deficiencies identified during installation verification and startup checklists. Deficiencies shall be identified through commissioning issue logs provided by the CxA.
  4. Correction of deficiencies identified during installation verification and startup checklists. Deficiencies shall be identified through commissioning issue logs provided by the CxA.
  5. Provide CxA with access to the record documents. Finalize and make corrections to Record Documents as noted by the CxA prior to functional performance testing.
  6. List of any changes to equipment, SOO, and final schedules and setpoints.
  7. Provide CxA with remote access to Building Automation System.
  8. CC has reviewed and execute the FPTs in advance of the CxA witnessing the tests. Report any inconsistencies of expected results to the CxC and CxA.
- O. The CxA shall direct and document the functional performance testing while the CC is manipulating the controls system. It is also recommended that the installing contractor witness such testing in order to potentially resolve any issues found in a timely manner and avoid delays in commissioning and the overall construction schedule. The A/E team may choose to witness this testing as well at their discretion. Facilities staff may wish to witness this testing as well
- P. Each functional performance test shall be performed under conditions that simulate actual conditions as close as is practically possible. The sub executing the test shall provide all necessary materials, system modifications, etc., to produce the necessary flows, pressures, temperature, etc., necessary to execute the test according to the specified conditions. At the completion of the test, the sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
- Q. Sample Testing: Multiple identical pieces of non-life-safety or otherwise non-critical, low-priority equipment may be functionally tested using a standard sampling strategy. Significant application differences and significant sequence of

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operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference alone does not constitute a difference. The specific sample testing strategy allowed should be proposed, reviewed, and approved by the commissioning contract holder, as well as facilities prior to approval. It is noted that no sample testing by the subs is allowed in installation verification checklists or pre-testing required of the subs.

1. The example below describes a 20% sampling strategy – 10% failure rule.
  - a. Randomly test at least 20% of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample”.
  - b. If 10% or more of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
  - c. If 10% or more of the units in the second sample fail, test all remaining units in the whole group.
  - d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible contractor to perform and document a checkout of the remaining units, prior to continuing with functional performance testing the remaining units.
  - e. Any cost associated with these failures and retests shall be the responsibility of the contractor.
  
- R. Coordination and Scheduling: The contractor shall provide sufficient notice (two (2) weeks) to the CxA regarding their completion schedule for the installation verification checklists, startup, checkout, and pretesting of all equipment and systems. The CxA will schedule functional performance testing through the GC and appropriate subs. The CxA shall direct, witness and document the functional performance testing of all equipment and systems. The subs shall execute the tests.
  
- S. Any issues noted during functional performance testing with regards to material, equipment, installation, or set up shall be corrected at the sub’s expense and the system shall be retested. The CxA shall notify the commissioning contract holder.
  
- T. The CxA shall record the results of the functional performance test using the documentation prepared for that purpose.
  
- U. Deficiencies found during testing shall be recorded on the FPT form and communicated in the Cx issue log.
  
- V. Deficiencies found during testing shall be corrected by the contractor within 7 days of receiving an Issues Log from the CxA. Deficiencies shall be retested without cost to the owner until accepted by the Commissioning Authority. Where

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there is a dispute over a deficiency, the Engineer of Record shall be the final authority.

- W. Problem Solving: The CxA may recommend solutions to problems found, but the burden of responsibility to solve, correct, and retest problems is with the contractor.
- X. All testing, retesting, and acceptance of functional performance testing shall be completed prior to Substantial Completion. Seasonal Testing may occur after Substantial Completion, where necessary.

**3.8 HVAC AND PLUMBING SPECIFIC TASKS**

**A. COMMISSIONING OF HVAC AND PLUMBING LABELING**

- 1. The CxA shall perform a spot check of the HVAC and Plumbing systems for appropriate labeling per the contract requirements or per Division 01, 22 or 23 requirements. The percent of spot check will be determined with ownership based on the project scope and scale of the project.

**3.9 ELECTRICAL SPECIFIC TASKS**

- A. The intent of this section is to specify unique responsibilities that are part of the commissioning process for the electrical systems. Any Electrical System testing required per other sections of Division 26 shall be completed in addition to the requirement of this section.
- Y. The test requirements listed in this section do not release the subcontractor from the obligation to perform all other appropriate, industry standard, manufacturer recommended or code-required checks or tests.
- Z. All testing documentation related to requirements of sections of Division 26 shall be provided to the Commissioning Authority for use and review.
- AA. The subcontractor shall provide all test equipment necessary to fulfill the checks and testing requirements. Testing equipment shall be calibrated and within the last 12 months. Provide calibration documentation to CxA as requested.

**BB. COMMISSIONING OF ELECTRICAL LABELING**

- 1. The CxA shall perform a spot check of electrical systems for appropriate labeling per the contract requirements or per Division 01 or 26 requirements.

**CC. COMMISSIONING OF ELECTRICAL SUBMETERS**

- 1. The contractor shall perform the following verifications prior to FPT:
  - a. Verify meter ID is consistent between label located on the physical meter and within the BMS or web-based dashboard interface.



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- b. Verify CTs are properly installed and oriented, and that leads are properly terminated at each meter.
  - c. CxA to observe the DDC contractor's measurement of all electrical loads by hand-held meter device. Instantaneous measurements are to be compared to the readings at the DDC System dashboard. The difference between the hand measurement and DDC readings shall be no greater than 5% for loaded operation.
2. Perform Functional Tests:
- a. The meter installation and programming shall be verified per the manufacturer's requirements.
  - b. The meter accuracy shall be verified by handheld multimeter readings compared to the dashboard readings.
  - c. Verify communications system connectivity for all energy metering devices with all software systems (e.g., dashboards, BMS systems, databases, etc.). Meter readings in the BMS (or web-based dashboard) match the readings on meter displays or temporary data loggers for the following points: voltage, amperage, power factor, demand (kW), and consumption (kWh).
  - d. Energy Balance – The sum of all submeter demand (kW) and energy consumption (kWh) readings plus data logger reading are within 3% of the main service energy usage for a full 7-day period (via main service submeter, if provided, or via the utility meter).
  - e. Verify the energy monitoring dashboard is functional and displaying correct information and pages as coordinated with the energy monitoring dashboard provider or owner.
  - f. Verify each page and resource is accessible and that there are no broken links or images.
  - g. Verify each meter is visible on the dashboard system and reporting accurately.

**DD. COMMISSIONING OF PHOTOVOLTAIC SYSTEM**

- 1. Provide a PV performance test as part of the commissioning functional performance tests, in which the total power output and solar input radiation are measured.
- 2. Measured power shall be within 10% of the total system rated output at the given solar input conditions.

**3.10 COST OF RETESTING**

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- A. The contractor to retest an equipment/system pretest or functional performance test, if they are responsible for the issue/failure, shall be responsible for the associated cost. If they are not responsible, any cost associated with the retest shall be negotiated with the GC.
- EE. For an issue identified, not related to any equipment/system pretest or functional performance test, or startup fault, the following shall apply: The CxA, commissioning contract holder, the GC and facilities will negotiate the fees associated and direct the retest of the equipment/system.
- FF. The time for the CxA to direct any retesting required because of a specific installation verification checklists, startup item, or pre-test, previously reported to have been successfully completed, but determined during functional performance testing to be faulty, will be back charged to the GC, who may choose to recover costs from the party responsible for executing the faulty pre-functional performance testing (startup, installation verification, pre-testing, etc.).
- GG. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a schedule extension by the GC.

**3.11 PERFORMANCE TRENDS**

- A. Prior to functional testing, the Controls Contractor (CC) shall set up trends on the BAS as specified in the FPTs and/or contract documents.
- HH. Remote access, when possible, shall be established prior to functional testing and the CxA shall be given access. If remote access is not possible, the CC shall download and submit trend data to the GC, who shall forward it to the CxA for review. The data must be electronic and in spreadsheet or database format.
- II. Controls contractor shall provide 48 hours of trend data, or remote access to trends, to CxA prior to testing. CxA will then determine whether the system is ready for testing. CxA shall review at least 48 hours of trend data prior to functional testing to ensure that all necessary points are connected and collecting data.
- JJ. Each control sequence shall be tested for proper operation. Trend logs shall be collected during the functional testing period.
- KK. Trends are also required following functional performance testing. The CxA shall review a minimum of 72 hours of trend data; trend duration should include a normal workday and weekend.
- LL. Trends may also be required for review by the CxA during the post occupancy review period.
- MM. Any issues found during the trend review process will be reported on the commissioning issue log.

**3.12 OPERATIONS AND CLOSEOUT DOCUMENTS**

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- A. The CxC shall compile all close out documents required by the contract documents, including O&M manuals, equipment warranties, contractor guarantees, and as-builts and verify compliance with the contract documents.
- NN. CxC shall forward a complete set of documents to CxA, Owner, and EOR for review and approval.
- OO. Contractor shall make corrections to the O&M documents within 7 days of receipt of review comments.
- PP. The final approved O&M documents shall then be forwarded to the CxA for review in accordance with the contract document requirements. Follow the normal submittal procedure for this submittal.

**3.13 TRAINING**

- A. Training of the appropriate maintenance staff for each equipment type or system shall be documented for inclusion in the commissioning report.
- QQ. Training shall include procedures to operate and maintain the building in a cost-effective and energy efficient manner.
- RR. The GC shall provide a written training plan for the targeted audience for review by the CxA. Training plan is to be submitted prior to the completion of the functional performance testing.
- SS. Submit training plan, including a training agenda, proposed schedule with date and length of training, targeted audience, and qualifications of trainer. Send proposed training plan to the Owner and CxA for review 2 weeks prior to training. CxA shall review its content and adequacy.
- TT. The O&M manuals shall be available as reference material for the training sessions.
- UU. Instruct Owner's operating personnel in proper startup sequences, operation, shutdown, and maintenance procedures, including normal and emergency procedures. Review the SOO documentation.
- VV. Training will include a field demonstration of each major piece of equipment.
- WW. Submit a written record of the session, complete with an attendance list (training log) to the CxA. The training log is to be signed by all attendees. The training plan and training log are to be included in the commissioning report.
- XX. In addition to these general requirements, specific training requirements for commissioned equipment specified in other Divisions is still applicable.

**3.14 COMMISSIONING REPORT**

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- A. At the completion of commissioning, the CxA shall compile a final commissioning report. The report shall be provided in searchable PDF format. Please coordinate with the commissioning contract holder as well as facilities for final report submission requirements.
- YY. The report shall be compiled in an organized fashion, either by equipment, system, floor, etc. depending on the best fit for the project type, size, location, etc.
- ZZ. The report shall be menu driven and have adequate bookmarks for easy navigation as well as a search feature.
- AAA. This report shall include the following at a minimum.
1. A final commissioning summary identifying the commissioning scope of work, basic equipment/system descriptions, outstanding issues, recommendations, plan for future/deferred testing, approval, etc.
  2. Final commissioning plan
  3. Basis of Design and Owners Project Requirements (if applicable)
  4. All site visit reports.
  5. One complete, fully updated issues log identifying all issues that were noted, corrections that were made, notes and comments. If there are any open items, provide explanations in the issues log as to why the item remains open and what is being done to resolve.
  6. Commissioning Meeting Minutes/Notes
  7. Document Reviews (scope of work dependent)
  8. The CxA provided, installing contractor completed installation verification checklists.
  9. Startup documentation.
  10. Contractor testing documentation (pressure tests, point-to-point documentation, pretesting documentation, FPT readiness forms, etc.)
  11. Contractor provided equipment list including equipment identification, location, service, make, model, etc.
  12. Completed functional performance testing documentation verification. Include any special notes, recommendations, set points, etc. that may be beneficial to the operations personnel for proper future operation and functionality of the equipment/system.
  13. Sequence of Operations
  14. Test, Adjust, Balance (Test and Balance, TAB) report and verification documentation.
  15. Training approval, documentation, etc. (scope of work dependent)

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16. O&M Manual Review documentation (scope of work dependent)
17. All documentation required by any local utility company commissioning related programs, rebates, etc. that were sought as part of the commissioning scope of work.

BBB. Final report to be provided within 60 days of final resolution of issue log.

CCC. Provide AHJ commissioning report prior to Certificate of Occupancy.

### 3.15 POST OCCUPANCY REVIEW

- A. Approximately 10 months after Substantial Completion (or 10 months after the start of the contractor's warranty), the CxA shall provide a building operation review of the commissioned systems.

DDD. The CxA will be available to discuss outstanding issue log items and other conditions inconsistent with the functional expectations of the building operations by the Owner's representatives, building users, and maintenance personnel.

EEE. The CxA will assist in drafting a plan to remedy outstanding issues raised at this review meeting.

FFF. A summary report of the post occupancy review will be provided to the Owner.

### 3.16 DEFERRED TESTING

- A. Equipment requiring seasonal testing to properly assure equipment operations, as determined by the CxA shall require the contractor to perform functional performance testing at a later time. At no time shall the testing extend beyond the warranty period.

GGG. Unforeseen Deferred Tests: Checks or tests not completed due to the required occupancy condition, or other conditions may be delayed upon approval of the Owner.

HHH. Post Occupancy Review: CxA may require contractor to perform additional testing when results from the Post occupancy review suggest components, systems, or system's integration is failing during the warranty period.

### 3.17 ACCEPTANCE

- A. The commissioning process shall be completed when the systems operate according to the Owner's Project Requirements, Basis of Design, and Contract Documents, as determined by the CxA.
- III. The commissioning process may continue past Substantial Completion of the Project, until all non-compliance issues identified on the issue log have been resolved. Any remaining deficiencies are reported to the Owner for appropriate action.

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JJJ. The commissioning process does not take away from, nor shall it reduce, the responsibility of the system designers and/or installing contractors to provide a finished and fully functional product/system.

**END OF SECTION**

**SECTION 02 41 10**

**STRUCTURE DEMOLITION**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Demolish existing construction as required for Project.
  - 1. Remove existing materials and equipment from site.
  - 2. Remove foundations including basement floor slabs.
  - 3. Cap and identify active utilities.
  
- B. Related Sections:
  - 1. Section 01 11 00: Summary of work.
  - 2. Section 01 52 00: Temporary facilities.
  - 3. Section 01 74 19: Construction Waste management.
  - 4. Municipal Authorities: Dismantling, removing, and capping of Municipal utilities.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Do not interfere with use of adjacent buildings; maintain free and safe passage to and from.
  - 2. Prevent movement or settlement of adjacent structures, provide and place bracing or shoring and be responsible for safety and support of structures. Assume liability for movement, settlement, damage or injury.
  - 3. Cease operations and notify Architect immediately if safety of adjacent structures appears to be endangered; take precautions to properly support structures. Do not resume operations until safety is restored.
  - 4. Prevent movement, settlement or collapse of adjacent services, sidewalks, driveways, and trees. Assume liability for such movement, settlement, or collapse, promptly repair.
  - 5. Obtain permission from adjacent property owners when outriggers, swinging cranes or similar equipment traverse their property.
  
- B. Design/Build: Provide special engineering to ensure compliance with applicable codes and Contract Documents for shoring.
  
- C. Scheduling: Do not close or obstruct roadways without permits. Conduct operations with minimum interference to adjacent traffic.

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1.3 SUBMITTALS

- A. Action Submittals: Submit demolition procedures and operational sequence to ensure Project sequencing is consistent with Owner needs.
- B. Informational Submittal:
  - 1. Submit copies of permits and notices authorizing demolition work.
  - 2. Submit copies of certificates of severance of utility services.
  - 3. Submit copies of permit for transport and disposal of debris.
- C. Pre-Demolition Photographs: Show conditions of exiting adjacent construction and site improvements that might be misconstrued as damaged by demolition operations. Submit before work begins.
- D. Design/Build Certificates: Submit certification signed by California licensed structural engineer indicating shoring compliance with code requirements.

1.4 QUALITY ASSURANCE

- A. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

1.5 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to pollution control for construction waste.

1.6 SITE CONDITIONS

- A. Structures to be demolished shall be evacuated and their use discontinued before start of work.
- B. Arrange and pay for disconnecting or removing, capping, and plugging utility services; disconnect and stub off; notify affected utility company in advance and obtain approval before starting Work.



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- C. Place markers to indicate location of disconnected services; identify service lines and capping locations on Project Record Documents.
- D. Maintain access to existing walkways, exits, and adjacent occupied facilities.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Debris: Maintain possession of materials being demolished except where noted as a material for reinstallation or a material to be retained by Owner. Immediately remove debris from site.
- B. Owner Retained Materials: Contact Owner prior to beginning demolition to determine extent of materials to be retained. Carefully remove materials indicated to be retained by Owner; deliver and store where directed.
  - 1. Inventory and record condition of items to be retained by Owner.

**PART 3 - EXECUTION**

**3.1 DEMOLITION**

- A. Demolish structures and appurtenances in an orderly and careful manner.
- B. Perform demolition in accordance with authorities having jurisdiction.
  - 1. Do not use explosives.
- C. Keep work sprinkled to prevent dust; provide hoses and water as required for demolition. Coordinate potential availability of water from existing on-site water sources with Owner; do not use on-site water without prior written approval.
- D. Remove demolished materials from site, unless otherwise directed.
  - 1. Burning of materials on site is not permitted.
  - 2. Remove from site, contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers or public.
- E. Rough grade areas affected by demolition and leave level to within one percent; maintain grades and contours of site as indicated.
  - 1. Backfill over excavated areas, open pits and holes caused as a result of demolition which exceed excavation limits for project; use approved fill.
- F. Remove demolished materials, tools and equipment upon completion of work; leave site in condition acceptable to Architect.

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3.2 REPAIR

- A. Repair damage to adjacent structures caused as result of demolition.
- B. Repair demolition beyond that required for Project.

**END OF SECTION**

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**SECTION 03 10 00**

**CONCRETE FORMING AND ACCESSORIES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Form-facing material for cast-in-place concrete.

**1.2 ACTION SUBMITTALS**

**A. Shop Drawings:** Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
  - a. Location of construction joints is subject to approval of the Architect.

**PART 2 - PRODUCTS**

**2.1 FORM-FACING MATERIALS**

**A. As-Cast Surface Form-Facing Material:**

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete", and as follows:
  - a. Plywood, metal, or other approved panel materials.
  - b. Exterior-grade plywood panels, suitable for concrete forms.

**B. Concealed Surface Form-Facing Material:** Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

**2.2 RELATED MATERIALS**

**A. Chamfer Strips:** Wood, metal, or rubber strips, 3/4 by 3/4 inch, minimum.

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- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
  - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

**PART 3 - EXECUTION**

**3.1 INSTALLATION OF FORMWORK**

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
  - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
  - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
  - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
  - 1. Minimize joints.
  - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
  - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.

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- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
    - 1. Provide and secure units to support screed strips.
    - 2. Use strike-off templates or compacting-type screeds.
  - H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
    - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
    - 2. Locate temporary openings in forms at inconspicuous locations.
  - I. Chamfer exterior corners and edges of permanently exposed concrete.
  - J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
  - K. Construction and Movement Joints:
    - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
    - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
    - 3. Space vertical joints in walls as indicated on Drawings.
      - a. Locate joints near corners, and in concealed locations where possible.
  - L. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
    - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
    - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
  - M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
  - N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
  - O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- 3.2 INSTALLATION OF EMBEDDED ITEMS
- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
    - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

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2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Clean embedded items immediately prior to concrete placement.

**3.3 SHORING AND RESHORING INSTALLATION**

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

**END OF SECTION**

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**SECTION 03 20 00**

**CONCRETE REINFORCING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Steel reinforcement bars.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For the following:
1. Each type of steel reinforcement.
- B. Shop Drawings: Comply with ACI SP-066:
1. Include placing drawings that detail fabrication, bending, and placement.
  2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
1. Location of construction joints is subject to approval of Architect.
- D. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 RELATED REQUIREMENTS:**

- A. Section 01 81 13 Sustainable Design Requirements

**1.4 INFORMATIONAL SUBMITTALS**

- A. Material Test Reports: For the following, from a qualified testing agency:
1. Steel Reinforcement:
    - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

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1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
- C. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Do not cut or puncture vapor retarder.
  - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.



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**3.2 INSTALLATION OF STEEL REINFORCEMENT**

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
  - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with the Drawings.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
  - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
  - 2. Stagger splices in accordance with ACI 318.

**3.3 JOINTS**

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Continue reinforcement across construction joints unless otherwise indicated.

**3.4 INSTALLATION TOLERANCES**

- A. Comply with ACI 117.

**3.5 FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
  - 1. Steel-reinforcement placement.

**END OF SECTION**

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**SECTION 03 30 00**

**CAST IN PLACE CONCRETE**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

**B. Related Requirements:**

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 01 81 13 Sustainable Design Requirements.

**1.2 DEFINITIONS**

- A. Cementitious Materials:** Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

- B. Water/Cement Ratio (w/cm):** The ratio by weight of water to cementitious materials.

**1.3 ACTION SUBMITTALS**

**A. Product Data:** For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:
  - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
7. Vapor retarders.
8. Curing materials.
9. Joint fillers.

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- B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
  2. Minimum 28-day compressive strength.
  3. Durability exposure class.
  4. Maximum w/cm.
  5. Calculated equilibrium unit weight, for lightweight concrete.
  6. Slump limit.
  7. Air content.
  8. Nominal maximum aggregate size.
  9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
  10. Intended placement method.
  11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    - a. Location of construction joints is subject to approval of the Architect.
- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
  2. Location within Project.
  3. Exposure Class designation.
  4. Formed Surface Finish designation and final finish.
  5. Final finish for floors.
  6. Curing process.
  7. Floor treatment if any.
- E. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
  2. Admixtures.
  3. Curing compounds.
  4. Vapor retarders.
  5. Joint-filler strips.
- B. Material Test Reports: For the following, from a qualified testing agency:
1. Portland cement.

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2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures.

1.5 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.7 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Cementitious Materials:
  1. See the Drawings.
- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
  1. Alkali-Silica Reaction: Comply with one of the following:
    - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.

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- b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
  - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
- 2. Maximum Coarse-Aggregate Size: see the Drawings.
  - 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
- 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  - 2. Retarding Admixture: ASTM C494/C494M, Type B.
  - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
  - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
  - 1. Color:
    - a. Ambient Temperature Below 50 deg F: Black.
    - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
    - c. Ambient Temperature Above 85 deg F: White.
- C. Curing Paper: 8-foot-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

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- D. Water: Potable or complying with ASTM C1602/C1602M.
- E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B.
- G. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: see the Drawings.
- B. Floor Slab Protective Covering: 8-foot-wide cellulose fabric.

2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
  - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
  - 2. Slag Cement: 50 percent by mass.
  - 3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
  - 4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions. See the Drawings for information.

2.7 CONCRETE MIXTURES

- A. Refer to the Drawings.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

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- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

**PART 3 - EXECUTION**

**3.1 INSTALLATION OF EMBEDDED ITEMS**

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

**3.2 INSTALLATION OF VAPOR RETARDER**

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
  2. Face laps away from exposed direction of concrete pour.
  3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
  4. Lap joints 6 inches and seal with manufacturer's recommended tape.
  5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
  6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
  7. Protect vapor retarder during placement of reinforcement and concrete.
    - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

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**3.3 JOINTS**

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
  - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
    - a. Continue reinforcement across construction joints unless otherwise indicated.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
  - 3. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 4. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  - 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Doweled Joints:
  - 1. Install dowel bars and support assemblies at joints where indicated on Drawings.

**3.4 CONCRETE PLACEMENT**

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
  - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
  - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.



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- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
  
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
  
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
  - 1. If a section cannot be placed continuously, provide construction joints as indicated.
  - 2. Deposit concrete to avoid segregation.
  - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
  
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Do not place concrete floors and slabs in a checkerboard sequence.
  - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 3. Maintain reinforcement in position on chairs during concrete placement.
  - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 5. Level concrete, cut high areas, and fill low areas.
  - 6. Slope surfaces uniformly to drains where required.
  - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
  - 8. Do not further disturb slab surfaces before starting finishing operations.

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**3.5 FINISHING FORMED SURFACES**

**A. As-Cast Surface Finishes:**

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
  - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
  - b. Remove projections larger than 1 inch.
  - c. Tie holes do not require patching.
  - d. Surface Tolerance: ACI 117 Class D.
  - e. Apply to concrete surfaces not exposed to public view.
  
2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
  - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
  - b. Remove projections larger than 1/4 inch.
  - c. Patch tie holes.
  - d. Surface Tolerance: ACI 117 Class B.
  - e. Locations: Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

**B. Related Unformed Surfaces:**

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

**3.6 FINISHING FLOORS AND SLABS**

**A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.**

**B. Scratch Finish:**

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

**C. Float Finish:**

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete

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surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish and measure surface, so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings and where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

### 3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

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- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
  
- C. Equipment Bases and Foundations:
  - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  - 2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
  - 3. Minimum Compressive Strength: 3000 psi at 28 days.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
  - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
  - 6. Prior to pouring concrete, place and secure anchorage devices.
    - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    - b. Cast anchor-bolt insert into bases.
    - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

**3.8 CONCRETE CURING**

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  - 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
  - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
  - 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.
  
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
  - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
  - 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
  - 3. If forms remain during curing period, moist cure after loosening forms.
  - 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
    - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

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- d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
  - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
    - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
    - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
- 1. Begin curing immediately after finishing concrete.
  - 2. Interior Concrete Floors:
    - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
      - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
        - a) Lap edges and ends of absorptive cover not less than 12 inches.
        - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
      - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
        - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
        - b) Cure for not less than seven days.
      - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
        - a) Water.
        - b) Continuous water-fog spray.
    - b. Floors to Receive Polished Finish: Contractor has option of the following:
      - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
        - a) Lap edges and ends of absorptive cover not less than 12 inches.
        - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

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- 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
  - a) Water.
  - b) Continuous water-fog spray.

c. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

d. Floors to Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.9 TOLERANCES

- A. Conform to ACI 117.

3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

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- a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
- 1) Project name.
  - 2) Name of testing agency.
  - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
  - 4) Name of concrete manufacturer.
  - 5) Date and time of inspection, sampling, and field testing.
  - 6) Date and time of concrete placement.
  - 7) Location in Work of concrete represented by samples.
  - 8) Date and time sample was obtained.
  - 9) Truck and batch ticket numbers.
  - 10) Design compressive strength at 28 days.
  - 11) Concrete mixture designation, proportions, and materials.
  - 12) Field test results.
  - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
  - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
  2. Verification of use of required design mixture.
  3. Concrete placement, including conveying and depositing.
  4. Curing procedures and maintenance of curing temperature.
  5. Verification of concrete strength before removal of shores and forms from beams and slabs.
  6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C143/C143M:

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- a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
- a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - b. Perform additional tests when concrete consistency appears to change.
4. Concrete Temperature: ASTM C1064/C1064M:
- a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
- a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M:
- a. Cast, initial cure, and field cure two sets of three standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
- a. Test one set of three field-cured specimens at seven days and one set of two specimens at 28 days.
  - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
- a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.



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- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
  - 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  - 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

**3.11 PROTECTION**

- A. Protect concrete surfaces as follows:
- 1. Protect from petroleum stains.
  - 2. Diaper hydraulic equipment used over concrete surfaces.
  - 3. Prohibit vehicles from interior concrete slabs.
  - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
  - 5. Prohibit placement of steel items on concrete surfaces.
  - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
  - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
  - 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

**END OF SECTION**

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**SECTION 03 32 00**

**CAST-IN-PLACE CONCRETE LANDSCAPE**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish all labor, materials, tools and equipment necessary to install cast-in-place concrete as indicated on the plans and as specified herein; including components and accessories required for a complete installation, including but not limited to the following components:
  - 1. Reinforcement
  - 2. Concrete materials
  - 3. Mix design, and
  - 4. Placement procedures.

**1.02 RELATED SECTIONS**

- A. Concrete Paving: Section 32 13 13.
- B. Earthwork: Section 31 00 00.
- C. Sustainable Design Requirements: Section 01 81 13
- D. Graffiti Resistant Coating: Section 0926 20

**1.03 SUBMITTALS**

- A. Procedures: In accordance with Submittal Procedures: Section 01 33 00.
- B. Product Data: For each manufactured material and product indicated.
- C. Design Mixes: For each concrete mix indicated.
- D. Shop Drawings: For steel reinforcement.
- E. Furnish sample of finish or job mock up, size as directed.
- F. Please refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

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- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete." Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Constructions and Materials"
  - 3. ACI 360R-06, "Design of Slabs on Grade"
- C. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel"
- D. Independent Testing Agency Review: Owner will engage a qualified independent testing agency to review concrete materials, concrete mix design, and procedures for concrete placement, curing and finishing.
- E. Mock-ups
  - 1. Build mockups of concrete paving and walls in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 36 inches by 36 inches.
  - 2. Mock-ups to be completed for each color and finish.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  - 5. Mock-up review will be completed after the concrete has cured- up to 30 days.
  - 6. Mock-ups to be completed at acceptance or Project Architect/ Landscape Architect. It is anticipated that minimum 2 rounds of mock-ups will be completed.

**1.05 PRODUCT HANDLING**

- A. Protection: Use adequate means to protect materials of this Section before, during and after installation and to protect the work and materials of other trades.
- B. Replacements: In the event of damage, immediately make repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

**1.06 INSPECTION**

- A. Verify that conditions are satisfactory for concrete paving work. Do not proceed with the work of the Section until unsatisfactory conditions have been corrected.
- B. Notify the Owner's Representative and Owner 48 hours prior to the pouring of concrete after all reinforcing, plumbing, electrical, etc., are in place for inspection.

**1.07 DEFINITIONS**

- A. The "Owner's Representative" is the person, appointed by the Owner, to represent their interests. The Owner's Representative will be on site frequently and regularly

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during construction. Where needed, the Owner's Representative will identify the need for field visits by the landscape architect or other consultants.

**PART 2 - PRODUCTS**

**2.01 FORM-FACING MATERIALS**

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practical sizes to minimize number of joints.
  - 1. Plywood, metal or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

**2.02 STEEL REINFORCEMENT**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
  - 1. Reinforcement to be welded shall meet chemical requirements of ASTM A 706.
- B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic or precast concrete according to CRSI's "Manual of Standard Practice."

**2.03 CONCRETE MATERIALS**

- A. Cementitious Material: Use the following cementitious materials of the same type, brand, and source throughout the Project:
  - 1. Portland Cement: ASTM C 150, Type II. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class F
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
  - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, Portland blast-furnace slag IP, Portland-pozzolan I (PM), pozzolan-modified Portland I (SM), slag-modified Portland cement.
  - 3. Silica Fume: ASTM C 1240, amorphous silica.
- B. Normal-Weight Aggregates: ASTM C 33, graded. Provide aggregates shown to have produced low-shrinkage concrete such as limestone or granite.
  - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

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- C. Water: ASTM C 94/C 94M and potable.
- D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494, Type A.
  - 2. Retarding Admixture: ASTM C 494, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- E. Air-Entraining Admixture: ASTM C 260
- F. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading and resistant to lime and other alkalis.
  - 1. Manufacturer: Davis Colors, telephone: 800-356-4848, web site: [www.daviscolors.com](http://www.daviscolors.com)
  - 2. Color: As shown on Drawings

#### 2.04 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq yd when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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**2.05 RELATED MATERIALS**

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Anchors:
  - 1. Adhesive Anchors (dowels) shall use a two-part epoxy adhesive and shall have a current ICC or NER Research Report. Simpson Strong-Tie "IXP Torque Controlled Adhesive Anchors" or equal.
  - 2. Expansion anchors shall have a current ICC or NER Research Report: Hilti, Inc. "Kwik-Bolt TZ," Simpson Strong-Tie "Strong-Bolt Wedge Anchor" or equal.
- C. Slab Construction Joint Devices: Tapered plate dowels, "Diamond Dowel System" by PNA Construction Technologies or equal.
  - 1. Space 1/4X4-1/2X4-1/2 (in) plates at 18 inch on center.
  - 2. Install per manufacturer's instructions.
- D. Construction Joint Devices: Integral galvanized steel; thick, formed to tongue and groove profile, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.
- E. Stair Tread Warning Stripe: Extruded aluminum nosing base with aluminum oxide abrasive anti-slip filler.
  - 1. Spectra type WP24A, manufactured by Wooster Products, Inc. tel. 800-321-4936, with black filler and sure-hold anchor extruded integrally full length of section, or approved equal.

**2.06 CONCRETE MIXTURES**

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Slabs-on-Grade: Proportion normal-weight concrete to provide a low-shrinkage concrete to minimize curling and cracking and as follows:
  - 1. Minimum Compressive Strength: 3000psi at 28 days when tested in accordance with ASTM C39.
  - 2. Maximum Water-Cementitious Materials Ratio: 45 percent by weight.
  - 3. Maximum Aggregate Size: 3/4 inch (19 mm) nominal.
  - 4. Slump Limit: 8 inches for concrete with a verified slump of 3 inches before adding high-range water reducing admixture or plasticizing admixture.
  - 5. Air Content: not to exceed 3 percent.
- C. Footings and Below Grade Walls: Proportion normal-weight concrete mixture as follows:

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1. Minimum Compressive Strength: 3000 psi at 28 days when tested in accordance with ASTM C39.
2. Minimum Cement Content: ACI 302.1R, Table 6.2.4.
3. Slump Limit: 4 inches.
4. Air Content: ACI 301 Table 4.2.2.4: mild exposure.

**2.07 FABRICATING REINFORCEMENT**

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

**2.08 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and furnish batch ticket information.
  1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

**2.09 LIQUID SANDBLAST**

- A. Lithocast Surface Retarder Exposed Aggregate Finish:
  1. Finishes to be selected from following series:
    - a. 03: Medium Sand Texture
    - b. 05: Coarse Sand Texture
    - c. 15: 1/8" to 1/4" Aggregate Exposure
    - d. 50: 3/8" to 1/2" Aggregate Exposure
    - e. 75: Small aggregate 3/8" Exposure
    - f. 125: 1/2" Aggregate Exposure
  2. Manufactured by Scofield/ Sika Corporation, 4155 Scofield Road, Douglasville, GA 30131, telephone: 800-800-9900, website: [www.scofield.com](http://www.scofield.com), product website: <http://www.scofield.com/scofield-lithocast-surface-retarder.html>

**2.10 OTHER MATERIALS**

- A. Materials, not specifically described but required for a complete and proper installation of the work of this Section, selected by the Contractor subject to the approval of the Owner's Representative.

**PART 3 - EXECUTION**

**3.01 FORMWORK**

- A. Design, erect, shore, brace and maintain formwork according to ACI 301 to support vertical, lateral, static and dynamic loads, and construction loads that might be applied until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation and position indicated, within tolerance limits of ACI 117.

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- C. Chamfer exterior corners and edges of permanently exposed concrete where indicated.

**3.02 EMBEDDED ITEMS**

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions and directions furnished with items to be embedded.

**3.03 VAPOR RETARDERS**

- A. Sheet Vapor Retarders: Place, protect and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect and repair bituminous vapor retarder according to manufacturer's written instructions.

**3.04 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
  - 2. Weld reinforcing bars according to AWS D1.4 where indicated.
  - 3. Install mechanical couplers according to ICC Evaluation Report where indicated.

**3.05 JOINTS**

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired at locations indicated or as approved by Architect.
  - 1. Surfaces against which concrete will be placed and which are noted as "Roughen" on the plans shall be clean and intentionally roughened to a full amplitude of approximately 1/4 inch.
- C. Control Joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/4-inch maximum with joints into concrete when cutting action will not tear, abrade or otherwise damage surface and before concrete develops random contraction cracks. Saw cut joints with 4 to 12 hours after the slab has been finished in an area in accordance with ACI 302.1R.



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- D. Expansion Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as columns, foundation walls, grade beams and other locations as indicated.

**3.06 PREPARATION**

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
  - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications and where curing under humid conditions is required.

**3.07 PLACING CONCRETE**

- A. Before placing concrete, verify that installation of formwork, reinforcement and embedded items is complete and that required inspections have been performed.
- B. Cold-Weather Placement: Comply with ACI 306.1.
- C. Hot-Weather Placement: Comply with ACI 301.
- D. Place concrete in accordance with ACI 304R.
- E. Place concrete for floor slabs in accordance with ACI 302.1R
- F. Ensure reinforcement, inserts, embedded parts and formed construction joint devices will not be disturbed during concrete placement.
- G. Install joint devices in accordance with manufacturer's instructions.
- H. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- I. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.
- J. Place concrete continuously between predetermined expansion, control and construction joints.
- K. Do not interrupt successive placement; do not permit cold joints to occur.
- L. Place floor slabs in checkerboard or saw cut pattern indicated.
- M. Screed floors level, within tolerance of ¼ inch in 10 feet and as indicated on drawings.

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**3.08 FINISHING FORMED SURFACES**

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces exposed to public view and to 6" below finish grade when adjacent to planting area.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces exposed to public view and to 6" below finish grade when adjacent to planting area.
- C. Liquid Sandblast Finish: apply after forms have been removed and according to manufacturer's requirements.
  - 1. Apply to concrete surfaces exposed to public view and to 6" below finish grade when adjacent to planting area.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent unformed surfaces, unless otherwise indicated.

**3.09 FINISHING FORMED SURFACES**

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing materials with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces as shown on Drawings.
- C. Board-formed finish:
  - 1. Design, construct, and maintain forms to ensure that after removal the finished concrete will have true surfaces free of offset, waviness, or bulges and will conform accurately to the indicated shapes, dimensions, lines, elevations, and positions.
  - 2. Use 6" boards of close-grain lumber and free of knots.
- D. Bead Blasting Finish:

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1. Perform bead blasting at least 72 hours after placement of concrete. Coordinate construction schedule to ensure that surfaces are blasted at the same age for uniform results.
  2. Perform bead blasting in as continuous operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns of variances in depth of blasting as indicated.
  3. Depth of blasting: Perform blasting to match approved mockup sample.
    - a. Light finish: Expose fine aggregate with occasional exposure of coarse aggregate; maximum 1/16-inch reveal.
    - b. Medium finish: Expose fine aggregate with occasional exposure of coarse aggregate; maximum 1/8-inch reveal.
    - c. Heavy finish: Generally expose coarse aggregate; 3/16-inch to 1/4-inch reveal.
  4. Collect and recycle spent blasting media by experienced, qualified company.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening and finishing operation for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms or rakes to produce a profile amplitude of 1/4-inch in one direction.
1. Apply scratch finish to surfaces to receive concrete rubber safety surfacing.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply trowel finish to surfaces exposed to view.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
    - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

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3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed ¼-inch.

**3.11 CONCRETE PROTECTING AND CURING**

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lbs/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
  2. Moisture-Retaining-Cover-Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practical width, with ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days.
  3. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

**3.12 CONCRETE SURFACE REPAIRS**

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

**3.13 FIELD QUALITY CONTROL**

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform special inspections as specified in California Building Code (CBC), 2016, Edition, Section 1704.
  1. Inspect concrete placement.
  2. Test concrete in accordance with ACI 301.
  3. Inspect reinforcement placement for conformance with Contract Documents.
  4. Inspect installation of expansion and adhesive anchors.

**3.14 CLEAN-UP**

- A. Keep work areas in workmanlike and safe condition so rubbish, wastes, and debris do not interfere with the work of others. Upon completion of work in this section, remove all rubbish, waste, and debris resulting from the operations. Remove all equipment and implements of service and leave entire area in a neat, clean, acceptable condition to the satisfaction of the Owner's Representative.

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**END OF SECTION**

**SECTION 03 35 15**

**SEALED CONCRETE FLOORING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide concrete flooring sealing system for heavy duty applications for public restroom building floors.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 03 35 50: Polished concrete floors.
  - 3. Appendix A: Finish and Materials Schedule.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing pouring of concrete slabs at areas indicated to have a sealed concrete floor finish.
  - 1. Require attendance of those directly affecting work of this Section including those related to concrete materials, concrete forming and preparation, concrete pouring, and finishing, and sealed concrete flooring.
  - 2. Review concrete installation and finishing procedures and coordination required with related work and polishing requirements.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature for each type of material involved in sealing concrete.
- B. Samples: Furnish sample panels of sealed concrete.
- C. Maintenance Instructions: Provide written instructions for recommended periodic maintenance.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Sealed Concrete Floor Installers: Firms with not less than five years successful experience sealing concrete using one of specified systems and acceptable to system manufacturer.
- C. Mock-Up: Erect approximately 10 square feet of sealed concrete flooring at location as approved. Approved mock-up may be incorporated into Project.

**PART 2 - PRODUCTS**

**2.1 SYSTEM MANUFACTURERS**

Manufacturers below, or approved equal:

- A. W.R. Meadows, Inc. (800.342.5976).
- B. PROSOCO, Inc. (800.255.4255).
- C. L.M. Scofield Co. (800.800.9900).
- D. Advanced Floor Products (888.942.3144).

**2.2 MATERIALS**

- A. System Description: Provide sealed concrete flooring including preparation of concrete substrate and sealing.
- B. Regulatory Requirements, VOC Emissions: Comply with applicable limitations for volatile organic compound (VOC) emissions for concrete sealing materials.
- C. Accessibility Regulatory Requirements: Provide for assuring access for persons with disabilities in accordance with state and federal regulations for slip resistance.
  - 1. California Regulations: Comply with California Building Standards Code.
  - 2. Federal Regulations: Comply with Americans with Disabilities Act (ADA) Standards.
  - 3. Slip-Resistant Hard Surfaces: Hard surface finishes to comply with requirements of authorities having jurisdiction for slip-resistant hard surfaces, including general code requirements and requirements for access for persons with disabilities.

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- D. Concrete Floor Sealing System: Provide system specified providing sealed concrete floor suitable for heavy duty applications.
  - 1. Basis of Design: W. R. Meadows, Inc./Bellatrix hybrid polymer penetrating and film-forming stain resisting concrete sealer.
- E. Crack Repair and Filler: Repair cracks including hairline cracks as small as 1/64" with product recommended by concrete sealing materials manufacturer but not less than Metzger McGuire/Rapid Refloor.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Ensure surfaces to receive sealer are clean and well cured.
- B. Do not commence work until surface conditions are within tolerances required for proper finishing based on manufacturer recommendations.
- C. Start of work indicates acceptance of conditions.

**3.2 PREPARATION**

- A. Clean concrete slab free from foreign matter and prepare concrete for sealing in accordance with system manufacturer recommendations.
- B. Patch and repair concrete as required to eliminate cracks, spalling, and defects detrimental to sealed concrete floor.
  - 1. Comply with crack repair and filler manufacturer recommendations for preparation and concrete repairs.

**3.3 INSTALLATION**

- A. Comply with sealer manufacturer recommendations and application instructions for application of concrete sealer as required to match approved samples and mock-up.

**3.4 PROTECTION**

- A. Comply with system manufacturer recommendations for protecting sealed floors until ready for use. Keep surface dry for minimum 48 hours after application.
- B. Do not permit traffic on sealed concrete floors for at least 72 hours.
- C. Protect sealed floor until Substantial Completion.
- D. Repair or replace sealed flooring damaged prior to Substantial Completion.

**END OF SECTION**



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**SECTION 03 35 50**

**POLISHED CONCRETE FLOORING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide polished concrete flooring system including preparation of concrete, curing, densifying, grinding, polishing, and sealing/enhancing, as required for complete finished installation.
  - 1. Contractor Option: Provide manufactured polished concrete flooring system or provide ground concrete using NTMA standards for terrazzo grinding and sealing.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 03 35 15: Sealed concrete flooring for public restroom building.
  - 3. Appendix A: Finish and Materials Schedule

**1.2 REFERENCES**

- A. Terrazzo Technical Data, National Terrazzo and Mosaic Association, Inc. (NTMA).

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing pouring of concrete slabs at areas indicated to have a polished concrete floor finish.
  - 1. Require attendance of those directly affecting work of this Section including those related to concrete materials, concrete forming and preparation, concrete pouring and finishing, and polished concrete flooring.
  - 2. Review concrete installation and finishing procedures and coordination required with related work and polishing requirements.

**1.4 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature for each type of material involved in polished concrete including methods for grinding and polishing.
- B. Samples: Furnish sample panels of polished concrete.
- C. Maintenance Instructions: Provide written instructions for recommended periodic maintenance.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.

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2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Polish Floor Installers:
  1. Manufactured System: Firms with not less than five years successful experience polishing concrete using one of specified systems and acceptable to system manufacturer.
  2. NTMA System: Member of Western States Terrazzo Association with minimum five years successful experience fabricating specified flooring.
    - a. Associated Terrazzo Co., Inc.
    - b. San Francisco Terrazzo.
    - c. Approved equal
- C. Mock-Up: Erect minimum 100 square feet of polished concrete flooring at location as approved. Approved mock-up may be incorporated into Project.

**PART 2 - PRODUCTS**

**2.1 SYSTEM MANUFACTURERS**

Manufacturers below, or approved equal:

- A. W.R. Meadows, Inc. (800.342.5976)/Induroshine Polished Concrete Floor System.
- B. PROSOCO, Inc. (800.255.4255)/Consolideck System.
- C. L.M. Scofield Co. (800.800.9900)/Formula One System.
- D. Advanced Floor Products (888.942.3144)/The RetroPlate System.

**2.2 MATERIALS**

- A. System Description: Provide polished concrete flooring including preparation of concrete substrate, curing, densifying, grinding, polishing, and sealing/enhancing.

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- B. Regulatory Requirements, VOC Emissions: Comply with applicable limitations for volatile organic compound (VOC) emissions for integral color concrete materials.
- C. Accessibility Regulatory Requirements: Provide for assuring access for persons with disabilities in accordance with state and federal regulations for slip resistance.
  - 1. California Regulations: Comply with California Building Standards Code.
  - 2. Federal Regulations: Comply with Americans with Disabilities Act (ADA) Standards.
  - 3. Slip-Resistance: Hard surface finishes to comply with requirements of authorities having jurisdiction for slip-resistant hard surfaces, including general code requirements and access for persons with disabilities.
- D. Manufactured Polished Concrete Flooring System: Provide system specified providing polished concrete floor to match Architect samples.
  - 1. Basis of Design: W. R. Meadows, Inc./Induroshine PS-2, system consisting of densifier, and equipment and processes necessary to achieve semi-gloss finish that will reflect images from both side and overhead.
    - a. Densifier: Match W. R. Meadows/Liqui-Hard waterborne concrete densifier and chemical hardening compound.
    - b. Stain Resistant Sealer/Enhancer: Match W. R. Meadows/Bellatrix hybrid polymer penetrating and film-forming concrete sealer and enhancer.
- E. NTMA System Curing Compound, Cleaning, Sealing and Finishing Compounds: As recommended by NTMA and manufacturer for terrazzo use.
  - 1. Curing Compound: ASTM C309, Type 1.
  - 2. Cleaner: Free from crystallizing salts and water-soluble alkaline salts, biodegradable, and phosphate free, Ph factor between 7 and 10.
  - 3. Sealer: Penetrating type specifically prepared for use on terrazzo and as required to produce slip resistant finish; sealer shall not discolor or amber; Ph factor between 7 and 10.
    - a. Sealer shall produce slip resistant surface.
- F. Crack Repair and Filler (Both Systems): Repair cracks including hairline cracks as small as 1/64" with product recommended by polished concrete materials manufacturer but not less than Metzger McGuire/Rapid Refloor; color to match concrete floor.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Prior to application of polish ensure surfaces are level, with maximum surface variation of 1/4" in 10'-0".

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- B. Ensure surfaces are clean and well cured.
- C. Do not commence work until surface conditions are within tolerances required for proper finishing.
- D. Start of work indicates acceptance of conditions.

### 3.2 PREPARATION

- A. General: Patch and repair concrete substrates as required to eliminate cracks, spalling, and defects detrimental to polished concrete floor. Comply with crack repair and filler manufacturer recommendations for preparation and concrete repairs.
  - 1. Fill control joints to be flush with concrete surface; comply with material manufacturer recommendations and instructions for preparation and installation of control joint filler.
- B. Manufactured System: Clean concrete slab free from foreign matter and prepare concrete for polishing in accordance with system manufacturer recommendations.
- C. NTMA System: Clean concrete slab free from foreign matter; comply with NTMA recommendations.

### 3.3 INSTALLATION

- A. Manufactured System: Comply with general structural concrete requirements for installation of concrete along with recommendations of integral color materials manufacturer and polished concrete system manufacturer.
  - 1. Produce polished concrete finish surface in accordance with polished concrete flooring material manufacturer recommendations and instructions and as required to match approved samples and mock-up.
  - 2. Densifying: Apply densifier in accordance with manufacture recommendations and application instructions.
  - 3. Grinding and Polishing: Follow manufacturer recommendations for finishing including grinding and polishing.
    - a. Equipment: Use equipment recommended by system manufacturer and as required to achieve finish matching approved samples and mock-up.
  - 4. Sealing/Enhancing: Apply sealer/enhancer in accordance with manufacturer recommendations and application instructions.
- B. NTMA System: Follow NTMA recommendations for finishing including rough grinding, grouting, curing grout, fine grinding, cleaning, and sealing.
  - 1. Rough Grinding: Rough grind with 24 or finer grit stones or comparable diamond plates and follow with 80 or finer grit stones.
  - 2. Grouting: Clean and rinse floor, remove excess rinse water and machine or hand apply grout matching concrete. Take care to completely fill voids.

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3. Fine Grinding: Fine grind with 100 or finer grit stones until grout is removed from surface, and polished finished matching approved sample is achieved.
4. Cleaning and Sealing: Clean after grinding and allow surface to thoroughly dry; apply sealer in accordance with manufacturer's directions.

C. Reflectivity:

1. Medium Polish: Provide reflectivity as can be generally attained with 800 grit stones where floor exhibits shine but not mirror-like reflection.

3.4 CLEANING

- A. Manufactured System: Comply with system manufacturer recommendations.
- B. Use clean water and stiff bristle fiber brushes to clean polished concrete flooring.
- C. Do not use wire brushes, acid type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage polished concrete.

3.5 PROTECTION

- A. Manufactured System: Comply with system manufacturer recommendations. Keep surface dry for minimum 48 hours after application.
  1. Do not permit traffic on polished concrete floors for at least 72 hours.
- B. Protect finished floor until Substantial Completion.
- C. Repair or replace flooring system damaged prior to Substantial Completion.

**END OF SECTION**

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**SECTION 03 35 65**

**ARCHITECTURAL CONCRETE FINISHES**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Provide architectural concrete wall and stair finishes.
  - 1. Contractor Option Walls: Provide board formed architectural concrete.
  - 2. Contractor Option Walls: Provide form liner with board formed appearance.
  - 3. Steps: Provide light beadblasted architectural concrete.
  - 4. Provide integral color concrete for architectural concrete walls and for steps.
  
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Division 03: Structural cast-in-place concrete requirements for standard finishes.
  - 3. Section 03 35 15: Sealed concrete flooring for public restroom building.
  - 4. Section 03 35 50: Polished concrete flooring.

1.2 REFERENCES

- A. American Concrete Institute (ACI) 318 - Building Code Requirements for Reinforced Concrete and ACI 347 - Concrete Formwork.

1.3 SUBMITTALS

- A. Proposed Mixes: Submit design mixes indicating concrete mix for architectural concrete finishes meets requirements of both structural concrete and architectural concrete.
  
- B. Samples: Submit 2" thick samples, with one surface representative of each required architectural concrete finish.
  
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
  
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Qualification of Installer: Company with minimum five-years successful experience in architectural cast-in-place concrete finishes as required for Project.
- C. Mock-Up: Erect full-size architectural concrete on site with face representative of each proposed finish; minimum 100 square feet for walls and two adjacent steps; locations on site as approved by Architect.
  - 1. Approved mock-ups may be incorporated into Project where integration can be done without being obvious.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide architectural concrete wall and step finishes.
- B. General: Comply with ACI 318, including referenced ASTM standards and Contract Document requirements for structural characteristics of architectural finished concrete.
  - 1. Comply with requirements of other Division 03 sections for structural requirements of concrete.
  - 2. Materials: Furnish materials for cast-in-place concrete to receive architectural concrete finishes from a single source.
  - 3. Mixing: Architectural concrete to be factory premixed, site mixing of materials is not acceptable.
- C. Cement: ASTM C150; use only one brand and type of cement for architectural concrete.
  - 1. Integral Color Concrete Finish: Use Type I white cement.
- D. Aggregates: Conform to applicable requirements for standard concrete aggregates and with following requirements; aggregates free from materials which may be detrimental to concrete and finish.
  - 1. Aggregates: Size, type, and color to match approved sample and mock-up; washed.

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2. Provide each type of aggregate from a single source and of same type and color for entire job.
- E. Integral Color Pigments: Pure, non-fading, non-staining, mineral oxides color conforming to ASTM C979 and designed and mixed to provide uniform color finish.
1. Manufacturers below, or approved equal:
    - a. L.M. Scofield Co./Chromix.
    - b. Davis Colors/True Tone Colors.
    - c. Solomon Grind-Chem Service, Inc./Solomon Colors.
  2. Colors: As indicated, as directed by Architect where not indicated.
    - a. Match Architect approved samples and mock-up.
    - b. Custom colors may be required.
- F. Water: Drinkable, free of foreign materials in amounts harmful to concrete and embedded steel.
- G. Plasticizers, Pigments and Admixtures: Of types and quantities to provide concrete mix necessary to match approved sample and mock-up.
- H. Contractor Option Wood Board Forms: Wood board forms in sizes as indicated on Drawings, S4S, plain cut, Douglas Fir, Larch, or Cedar, with cut edges straight at 90 degrees from side edges.
- I. Contractor Option Board Form Finish Form Liner: Provide board form type form liner designed to impress concrete surface with appearance of wood board forms matching approved samples and mock-up; multi-use or single use plastic-based material.
1. Manufacturers below, or approved equal:
    - a. Greenstreak/Wood Texture Wood Board Form Liners.
    - b. Fitzgerald Formliners/Wood Plank Form Liners.
    - c. Spec Formliners, Inc./Board Form Form Liners.
  2. Forms: Type recommended for use with form liners and as required to achieve architectural textured finish.
- J. Form Ties: As approved by Architect.
- K. Form Release Agent: Non-staining type that does not adversely affect concrete surface or materials fixed to concrete.
1. Manufacturers below, or approved equal:
    - a. Greenstreak/7000 Release Agent.
    - b. Symons Corporation/Magic Kote.
    - c. Burke Concrete Accessories, Inc./Burke Release.



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**2.2 FABRICATION**

- A. Formwork: Design, erect, support, brace, and maintain board formwork to support anticipated vertical and lateral loads.
  - 1. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained full strength.
  - 2. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
  - 3. Support form facing materials by support members spaced sufficiently close to prevent deflection.
    - a. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities; do not align end cuts of board forms within three courses of boards.
  - 4. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
  - 5. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement; solidly butt joints and provide backup material at joints as required to prevent leakage and fins beyond those approved for mock-up.
- B. Board Forms: Construct as required to achieve board form finish to match approved samples and mock-up.
  - 1. Apply release materials in accordance with manufacturer recommendations.
- C. Form Liners: Apply form liner to form face in accordance with form liner manufacturer recommendations and installation instructions to achieve uniform surface texture on concrete matching approved samples and mock-up.
  - 1. Take special care to align form liners to achieve overall uniform board form appearance with minimal recognition of joints between form liners.
  - 2. Where multi-use form liners are used clean form liners between each use to avoid irregularities from debris from earlier use; do not reuse damaged form liners.
  - 3. Apply release materials in accordance with form liner manufacturer recommendations; where manufacturer allows option of using or not using release materials, release materials are required.

**2.3 MIXES**

- A. Use mixes as required to meet structural and architectural finish requirements.
- B. Maintain water content as consistent as possible during initial mixing. Do not add water during transportation or placement of architectural concrete.
- C. Mix in admixtures in accordance with manufacturer's recommendations.

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine existing substrates and conditions; beginning architectural concrete work signifies acceptance of substrates and conditions.

**3.2 PREPARATION**

- A. Remove dirt, loose material, oil, grease, paint, and other contaminants, leaving clean surface.

**3.3 FORMWORK**

- A. Construct forms complying with ACI 301 and ACI 347 and structural requirements as applicable to sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work finished structures.
- B. Provide openings, offsets, sinkages, keyways, recesses, chamfers, anchorages and inserts and other features required.
  - 1. Before placement check lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.
- C. Leakage: Erect forms tight to prevent leakage of mortar; after erection, seal cracks, holes, slits, gaps, and apertures in concrete forms so they will withstand pressure and will remain tight.
- D. Removal: Design and assemble forms for easy removal without hammering or prying against concrete surfaces.
  - 1. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
  - 2. Kerf wood inserts for forming keyways, reglets, recesses, and to prevent swelling and assure ease of removal.
- E. Corners: Form intersecting planes to provide true, clean-cut corners.
- F. Apply coating of release agent prior to formwork in accordance with release agent manufacturer's instructions.
- G. Obtain information from others in time to schedule and coordinate installation of items furnished by others to be embedded in concrete, so provisions for their work can be made without delaying Project.
  - 1. Take precautions to maintain alignment and prevent damage of such items during placement of concrete.
  - 2. Install items furnished by others in accordance to templates provided to assure proper location of finished items.

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- H. Formwork shall be observed continuously while concrete is being placed; permit no changes of elevation, plumbness, or camber. If weaknesses develop and forms show settlement or distortion, strengthen formwork.
- I. Do not subject concrete to superimposed loads until it has attained its full design strength.
- J. Removing Forms: Prying against face of concrete is not allowed; use wooden wedges.
  - 1. Remove forms in manner to ensure complete safety of members; do not disturb supporting forms until concrete has hardened sufficiently to permit removal without damage to concrete surface.

**3.4 CONCRETE INSTALLATION**

- A. Deposit and vibrate architectural concrete to ensure proper consolidation, elimination of unintentional cold joints, and to minimize entrapped air on exposed surfaces.
  - 1. Take special care to avoid diagonal cold joints; pour concrete in as nearly horizontal lifts as possible.
  - 2. Take special care to avoid damage to form liners and to inserts during pouring and vibrating of concrete.
- B. Cure architectural concrete surfaces under near identical conditions to minimize appearance blemishes.
- C. Conduct inspections with Architect and make repairs or replace unsatisfactory work as directed.

**3.5 BEADBLAST FINISH (SANDBLAST FINISH) FOR STEPS**

- A. Allow concrete to cure minimum 28 days prior to commencing beadblasting (sandblasting) operations.
- B. Protect adjacent materials and finishes from dust, dirt and other surface or physical damage during finishing operations; provide protection as required and remove at completion of work.
  - 1. Repair or replace other work damaged by sandblasting operations.
- C. Comply with applicable codes and requirements of applicable authorities for sandblasting operations.
- D. Perform sandblast finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish.
- E. Depth of Cut: Use abrasive grit (sand or other approved non-staining abrasive) of proper type and gradation to expose aggregate and surrounding matrix surfaces to match approved samples.

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1. Light Bead/Sand Blast Finish: Provide finish to remove laitance and surface skin of cement and sand, just sufficient to expose edges of closest coarse aggregate and to provide slip-resistant surface acceptable to authorities having jurisdiction.
2. Determine type of nozzle, nozzle pressure, and blasting techniques required to match approved samples and mock-ups.

3.6 CLEANING

- A. Maintain control of chips, dust, and debris in each area of work.
- B. Clean marks, debris, and dirt from exposed surfaces.

**END OF SECTION**

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**SECTION 04 22 00**

**CONCRETE UNIT MASONRY**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Steel reinforcing bars.

**1.2 RELATED REQUIREMENTS:**

- A. Section 01 81 13 Sustainable Design Requirements

**1.3 DEFINITIONS**

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Material Certificates: For each type and size of product. For masonry units, include data on material properties and material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  - 1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
  - 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

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1.2 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
  - 1. Where fire-resistance-rated construction is indicated, units are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C90.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
  - 2. Density Classification: Medium weight.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.

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- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- F. Aggregate for Mortar: ASTM C144.
  - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Water: Potable.

#### 2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

#### 2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
  - 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
  - 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

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1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized-steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized-steel wire.

**2.6 EMBEDDED FLASHING MATERIALS**

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
  2. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
  2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
  3. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch.
  4. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
  5. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637/D4637M, 0.040 inch thick.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

**2.7 MISCELLANEOUS MASONRY ACCESSORIES**

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.



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- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

**2.8 MORTAR AND GROUT MIXES**

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. For reinforced masonry, use portland cement-lime mortar.
  - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For reinforced masonry, use Type S.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments do not exceed 10 percent of portland cement by weight.
  - 2. Pigments do not exceed 5 percent of masonry cement by weight.
- E. Grout for Unit Masonry: Comply with ASTM C476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  - 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
  - 3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

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**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL**

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

**3.2 TOLERANCES**

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

**3.3 LAYING MASONRY WALLS**

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and

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offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

### 3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
  - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
  - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
  - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
  - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.5 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
  - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

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**3.6 FLASHING**

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
  - 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
  - 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

**3.7 REINFORCED UNIT MASONRY**

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - 2. Limit height of vertical grout pours to not more than 12.67 ft.

**3.8 FIELD QUALITY CONTROL**

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.

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- B. Inspections: Special inspections in accordance with Level B in TMS 402/ACI 530/ASCE 5.
  - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.
- I. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at seven days and at 28 days.

**3.9 PARGING**

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

**3.10 REPAIRING, POINTING, AND CLEANING**

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.

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2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

**END OF SECTION**

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**SECTION 04 22 10**

**ARCHITECTURAL CONCRETE UNIT MASONRY**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide concrete masonry unit construction, with mortar, reinforcement, anchorage, and accessories as required for complete installation.
  - 1. Cut and fit concrete masonry for work of other trades.
- B. Work Installed, Not Furnished: Build in items supplied by other trades and suppliers.
- C. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 09 90 00: Painting of exposed concrete masonry surfaces.
  - 3. Section 09 96 20: Graffiti Resistant Coating.
  - 4. Appendix A: Finish and Materials Schedule.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this section. Require attendance of parties directly affecting work of this section.
  - 1. Review installation procedures and coordination required with related work.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's certificate concrete masonry units conform to specified standards.
- B. Shop Drawings: Furnish drawings for reinforcing; show bar schedules, diagrams of bent bars, ties and arrangements and assemblies.
- C. Samples: Furnish section of exposed concrete masonry face indicating texture.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Mock-Up: Provide minimum 4'-0" by 6'-0" sample panel of concrete masonry construction, clearly indicating joints and methods of reinforcing. Erect mock-up at Project Site, in location as approved by Architect.
  - 1. Approved mock-up may be incorporated into Project.

**1.5 SITE CONDITIONS**

- A. Temperature: Maintain materials to minimum 50 degrees F prior to, during and 48 hours after completion of masonry work.
  - 1. Do not place masonry units when air temperature is below 40 degrees F.
  - 2. During colder weather, work may continue where equipment is used to maintain constant temperature above 40 degrees F and masonry work completed and in progress is kept covered.
  - 3. Protect masonry construction from direct wind and sun exposure when temperatures exceed 99 degrees F and relative humidity is less than 50 percent.
- B. Bracing: Provide temporary bracing during erection of masonry work, maintain in place until building structure provides permanent bracing.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description Includes: Provide concrete masonry unit construction, with mortar, reinforcement, anchorage, and accessories as required for complete installation.
- B. Regulatory Requirements: Perform concrete unit masonry work in accordance with requirements of California Building Standards Code except where more restrictive requirements are specified.
- C. Concrete Masonry Units: Hollow loadbearing units conforming to ASTM C90.
  - 1. Concrete Masonry Manufacturers, or approved equal:
    - a. Angelus Block, Co., Inc.
    - b. Basalite Concrete Products.
    - c. Orco Block Co., Inc.



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- d. RCP Block and Brick, Inc.
- 2. Weight and Compressive Strength: Refer to Structural Drawings.
- 3. Size: Nominal 8" by 16" face measurement with thickness as indicated on Drawings.
- 4. Exposed Face Surfaces: Dense with finish as approved by Architect prior to manufacturing; uniform texture throughout Project.
  - a. Texture: Ground face (smooth) as indicated on Drawings.
- 5. Special Shapes: Provide proper specially shaped units for caps, bond beams, lintels, corners, and jambs.
  - a. Exposed Special Shapes: Design bond beams, lintels, corners and jambs and fillers to match and complement block units; where required perform cutting with masonry saw.
- D. Mortar: Conform to ASTM C270, Type as indicated on Structural Drawings.
  - 1. Masonry Cement/Premix Mortar: Acceptable only if manufacturer certifies product is made of cement and lime, with no limestone or pulverized material used in lieu of hydrated lime.
- E. Grout: Conform to ASTM C476; minimum compressive strength as indicated on Structural Drawings.
  - 1. Grout Slump: Between 8" and 11".
  - 2. Grout shall contain no water reducers or plasticizers.
- F. Mortar and Grout Materials:
  - 1. Portland Cement: ASTM C150, Type I.
  - 2. Hydrated Lime: ASTM C207, Type S.
  - 3. Aggregates: Standard masonry mortar and grout type; clean, dry and protected against dampness, freezing and foreign matter.
    - a. Mortar Aggregates: Conform to ASTM C144.
    - b. Grout Aggregates: Conform to ASTM C404.
  - 4. Water: Clean, drinkable, free of injurious amounts of oil, alkali, organic matter, or other harmful materials.
- G. Reinforcement and Anchorages: Provide reinforcing and anchorages as indicated on Drawings.
  - 1. Deformed Bars: ASTM A615, Grade 60 for bars No. 3 and larger, unless otherwise indicated.

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2. Plain Bars: ASTM A675, Grade 80 for No. 2 bars, unless otherwise indicated.
  3. Joint Reinforcement: ASTM A82, free from mill scale and excess or loose rust deposits.
- H. Control Joints: Closed cell neoprene or PVC factory fabricated solid sections, resistant to oils and solvents, flexible at temperatures from 40-degree F after five hours exposure; ASTM D2240 minimum durometer 70.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Supply metal anchors required for concrete masonry to appropriate trades for placement; provide in quantities required for Project and direct placement.
  1. Ensure items built in by other trades are properly located and sized.
- B. Establish lines, levels, and coursing, protect from disturbance.
- C. Clean surfaces to receive masonry free from dirt, debris, and laitance.

**3.2 INSTALLATION**

- A. Do not wet concrete masonry units; lay units in mortar with full bed and head joints, properly jointed with other work.
  1. Fully bond corners and intersections.
  2. Align cells of units to maintain clear, unobstructed space for reinforcing and grout, keep cells free of mortar and debris.
- B. Do not shift or tap masonry units after mortar has taken initial set, where adjustment must be made, remove mortar, and replace.
- C. Buttering corners of joints and deep or excessive furrowing of mortar joints is not acceptable.
- D. Perform job site cutting with proper power tools to provide straight, true, unchipped edges.
- E. Provide structural anchorage or retention in accordance with applicable code requirements.
- F. Ensure masonry courses are of uniform height, make vertical and horizontal joints equal and of uniform thickness.
  1. Lay concrete unit masonry in running bond unless otherwise indicated.
  2. Course one block unit and one mortar joint to equal 8" unless other size masonry units are required.
- G. Remove excess mortar and projections, take care to prevent breaking block corners.

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- H. Tolerances: Comply with ACI 530.1/TMS 602 except where more restrictive tolerances are listed below.
1. Maximum allowable variation from masonry unit to adjacent masonry unit is 1/32" where masonry units are exposed in finished construction and where waterproofing is applied over masonry units.
  2. Maximum allowable variation from plane of wall is 1/4" in 10 feet, and maximum 1/2" in 20 feet or more.
  3. Maximum allowable variation from plumb is 1/4" per story, non-cumulative, and maximum 1/2" in two or more stories.
  4. Maximum allowable variation of level coursing is 1/8" in 3 feet, 1/4" in 10 feet and 1/2" in 30 feet.
- I. Mortar Joints: Compress joints with a round or curved metal tool to form a waterproof joint and a tight bond with concrete masonry units.
1. Compress mortar joints with jointing tool with minimum diameter three times width of mortar joint, to provide a flush surface where resilient base or waterproofing is to be applied over masonry.
  2. Mortar joint that are cracked or not bonded with face shells of concrete masonry units shall be removed and joints repointed prior to grout placement.
- J. Reinforcement and Anchorage: Fully reinforce corners and intersections. Lap splices minimum 6". Extend splices minimum 16" each side of openings.
1. Support and secure reinforcing bars to maintain within 1/2" of dimensioned position.
  2. Retain vertical reinforcement in position at top and bottom of cells and at intervals not to exceed 192 bar diameters.
- K. Lintels: Provide reinforced concrete masonry unit lintels over openings where steel lintels are not scheduled.
1. Use full length reinforcing bars.
- L. Grouting: Place grout when concrete masonry units are surface dry; consolidate and reconsolidate by mechanical vibration.
1. Fine Grout: Use for spaces less than 2" in width using low lift grouting techniques.
  2. Coarse Grout: Use for spaces 2" or more in width.
  3. When grouting is stopped for more than one hour, terminate grout approximately 2" below top of upper masonry unit to form positive key for subsequent grout placement.
  4. Low-Lift Grouting: Place first lift of grout at 16" and place subsequent lifts at 8" increments.

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- 5. Hi-Lift Grouting: Use only where specifically approved by Architect and only where grout spaces are 3" or greater in width.
  - a. Provide minimum 4" high cleanouts at bottom of each cell to be grouted, clean out cells and inspect prior to grouting.
  - b. Pump grout into cells with maximum 48" lifts.
  
- M. Built-In Work: As work progresses, build in frames, lintels, nailing strips, anchor bolts, plates, and other items supplied by other trades.
  - 1. Build in items plumb and true.
  - 2. Do not build in organic materials which will be subject to rot or deterioration.
  - 3. Bed anchors of frames in mortar joints; fill frame voids solid with mortar; fill masonry cores with grout minimum 12" from framed openings.
  
- N. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds; coordinate with work of other Specification sections to ensure correct size, shape, and location.

**3.3 CLEANING**

- A. Remove excess mortar and smears upon completion of masonry work.
- B. Point or replace defective mortar, match adjacent work.
- C. Clean soiled surfaces using a non-acidic solution which will not harm masonry or adjacent materials, consult masonry manufacturer for acceptable cleaners.
- D. Use non-metallic tools in cleaning operations.

**3.4 PROTECTION**

- A. Maintain protective boards at exposed external corners which may be damaged by construction activities; protect without damaging completed work.

**END OF SECTION**

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**SECTION 05 12 00**

**STRUCTURAL STEEL FRAMING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Structural steel.
2. Shear stud connectors, shop welded.
3. Shrinkage-resistant grout.

**1.2 RELATED REQUIREMENTS:**

- A. Section 01 81 13 Sustainable Design Requirements**

**1.3 DEFINITIONS**

- A. Structural Steel:** Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

**1.4 ACTION SUBMITTALS**

**A. Product Data:**

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Shop primer.
8. Galvanized-steel primer.
9. Etching cleaner.
10. Galvanized repair paint.
11. Shrinkage-resistant grout.

- B. Shop Drawings:** Show fabrication of structural-steel components.

- C. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.**

**1.5 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.**

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- B. Mill test reports for structural-steel materials, including chemical and physical properties.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
  - 1. ANSI/AISC 303.
  - 2. ANSI/AISC 360.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M.
- B. Channels, Angles: ASTM A36/A36M.
- C. Plate and Bar: ASTM A36/A36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
- E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-

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steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

- B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
  - 1. Finish: Hot-dip zinc coating.
- C. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

## 2.4 RODS

- A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
  - 1. Finish: Plain where concealed inside weather-tight construction, otherwise hot-dip zinc coating, ASTM A153/A153M, Class C.
- B. Threaded Rods: ASTM A36/A36M.
  - 1. Finish: Plain where concealed inside weather-tight construction, otherwise hot-dip zinc coating, ASTM A153/A153M, Class C.

## 2.5 PRIMER

- A. Steel Primer:
  - 1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer: MPI#26.
  - 1. Etching Cleaner: MPI#25, for galvanized steel.
  - 2. Galvanizing Repair Paint: ASTM A780/A780M.

## 2.6 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

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- B. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

**2.8 SHOP CONNECTIONS**

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

**2.9 GALVANIZING**

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
  - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

**2.10 SHOP PRIMING**

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Surfaces of high-strength bolted, slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 5. Galvanized surfaces.
  - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  - 1. SSPC-SP 6 (WAB)/NACE WAB-3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.
- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a



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minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
  2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
  3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E165/E165M.
    - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - c. Ultrasonic Inspection: ASTM E164.
    - d. Radiographic Inspection: ASTM E94/E94M.
  4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M.
  5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
  2. Weld plate washers to top of baseplate.

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3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

### 3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

### 3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

- 1) Liquid Penetrant Inspection: ASTM E165/E165M.
- 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
- 3) Ultrasonic Inspection: ASTM E164.
- 4) Radiographic Inspection: ASTM E94/E94M.

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**END OF SECTION**

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**SECTION 05 31 00**

**STEEL DECKING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Roof deck.

**1.2 RELATED REQUIREMENTS:**

- A. Section 01 81 13 Sustainable Design Requirements**

**1.3 ACTION SUBMITTALS**

**A. Product Data:**

1. Roof deck.

**B. Shop Drawings:**

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

- C. 1. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.**

**1.4 QUALITY ASSURANCE**

**A. Qualifications:**

1. **Welding Qualifications:** Qualify procedures and personnel in accordance with SDI QA/QC and the following welding code:
  - a. **AWS D1.3/D1.3M.**

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.**

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**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

**2.2 ROOF DECK**

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
  - 1. Galvanized- and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
    - a. Color: Manufacturer's standard.
  - 2. Deck Profile: As indicated in drawings
  - 3. Profile Depth: As indicated in drawings
  - 4. Design Uncoated-Steel Thickness: As indicated in drawings
  - 5. Span Condition: As indicated in drawings

**2.3 ACCESSORIES**

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- G. Galvanizing Repair Paint: ASTM A780/A780M.
- H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

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**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL**

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.
- B. Locate deck bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

**3.2 INSTALLATION OF ROOF DECK**

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
  - 1. Weld Diameter: as indicated.
  - 2. Weld Spacing: as indicated.
  - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: refer to Drawings
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
  - 1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
  - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

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- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

**3.3 REPAIR**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting:
  - 1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  - 2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

**3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
  - 1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
    - a. Field welds will be subject to inspection.
  - 2. Steel decking will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 053100

**END OF SECTION**

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**SECTION 05 50 01**

**LANDSCAPE METAL FABRICATIONS**

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**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section Includes: Miscellaneous metal fabrications and related connections including but not limited to the following:
  - 1. Metal landscape metal walls
  - 2. Landscape edging
  - 3. Miscellaneous metals

1.02 PRICE AND PAYMENT PROCEDURES

- A. Refer to Section 01 20 00, Price and Payment Procedures

1.03 RELATED REFERENCES

- A. Section 01 81 13 Sustainable Design Requirements

1.04 REFERENCES

- A. The editions referenced herein of Federal Specifications (Fed. Spec.) and of the other standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 30 00 for information concerning the availability and use of references.
  - 1. American National Standards Institute (ANSI)
  - 2. Aluminum Association (AA)
  - 3. American Institute of Steel Construction (AISC)
  - 4. American National Standards Institute (ANSI)
  - 5. American Society for Testing and Materials (ASTM)
  - 6. American Welding Society (AWS)
  - 7. National Association of Architectural Metal Manufacturer's (NAAMM)

1.05 SUBMITTALS

- A. Shop Drawings:
  - 1. Submit shop drawings of miscellaneous metal work giving sizes, details of fabrication and construction, methods of assembly and bracing, and locations of hardware, anchors, and accessories.
  - 2. Contractor shall be responsible for all fabrication and for correct fitting of metal members shown on shop drawings.
- B. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.



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- C. Submittal procedures and quantities are specified in Section 01 30 00.
- D. Please refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements

**1.06 REGULATORY REQUIREMENTS:**

- A. Provide products meeting the accessibility requirements of the Governing Building Code, Chapter 11B.
- B. Governing codes, regulations and fire and building officials are identified in Section 01 30 00.

**1.07 DELIVERY, STORAGE AND HANDLING:**

- A. Deliver material in time to ensure uninterrupted progress of the work. Store materials in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Store steel materials, either plain or fabricated, above the ground upon platforms, pallets, skids, or other supports. Keep materials free from dirt, grease, and other foreign matter, and protect from corrosion. Material showing evidence of damage will be rejected; immediately remove rejected materials from the work.

**1.08 FIELD MEASUREMENTS:**

- A. Secure all field measurements required for proper and adequate fabrication and installation of the work. Furnish templates for exact location of items to be embedded in concrete and masonry and setting instructions required for all installation work.

**PART 2 - PRODUCTS**

**2.01 MATERIALS:**

- A. Aluminum:
  - 1. Extrusions: ASTM B 221-02, alloy and temper specified for each item specified herein.
  - 2. Sheet: ASTM B 209-02a, alloy and temper specified for each item specified herein.
  - 3. Tubing: ASTM B 241-02, 6063-T6 alloy and temper.
- B. Ferrous Metal:
  - 1. Steel, Rolled Shapes, Bars and Plates: Standard structural sections, ASTM A 36-03a.
  - 2. Steel Tubing: ASTM A 500-03 or ASTM A 501-01, grade B, seamless.
  - 3. Steel Pipe: ASTM A 53-02, Type E or S, Grade B, schedule 40, unless otherwise specified.
  - 4. Steel Sheet:
    - a. Uncoated Sheet: Hot-rolled, ASTM A 1011-03; or cold-rolled ASTM A 1008-03, Class 1; of grade specified for the fabricated item.

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- b. Galvanized Sheet: ASTM A 653-03, Grade SQ, coating designation of G-90 unless otherwise indicated or specified.
  - 5. Anchors, Bolts, and Fastenings: ASTM A 307-02, Grade A and ASTM A 563-00.
  - 6. Electrodes: AWS A5.1-91 or A5.5-96 E60XX or E70XX.
  - 7. Pipe Sleeves: Pipe sleeves through concrete walls and footings shall be standard weight, wrought iron, mild steel, or cast iron sleeves with not less than 1/2 inch space all around between the sleeve and pipe.
- C. Corten Steel for Metal Walls
- 1. To meet ASTM specifications A588, A242, A606-4, with a minimum of 50ksi yield strength.
  - 2. Thicknesses as shown on Drawings.
- D. Shop Primer and Paint:
- 1. Acceptable Products: Provide one of the following products or equal product approved in accordance with Section 01 60 00:
    - a. Carboline Co.; No. GP-20 or GP-818
    - b. Rust-O-Leum Corp.; No. 678 or 7669
    - c. The Sherwin Williams Co.; No. B50 N 2 or B50N Z 6
    - d. Tnemec Co., Inc.; 10-99 or P10-99
  - 2. Composition: Fast curing, lead and chromate free, modified alkyd primer.
- E. Galvanizing Repair Compound:
- 1. Available Products: Provide one of the following products or equal product complying with the specified requirements:
    - a. Cominco, Ltd.; GalvaGuard
    - b. Keeler & Long; Kolorane Zinc Rich Primer #9700
    - c. ZRC Worldwide; ZRC Cold Galvanizing Compound
  - 2. Requirements: High zinc dust content galvanizing repair paint or cold or hot applied zinc rich material complying with ASTM A 780-01.
- F. Quick Setting Hydraulic Cement: Provide one of the following products or equal product complying with the specified requirements:
- a. Burke/Edoco Construction Chemicals; Burke Stone
  - b. Dayton Superior Chemical Division; Ankertite Cement
  - c. Lambert Corp.; Super Por-Rok
  - d. Tamms Industries Co.; Rapid Rock
- G. Nonmetallic, Nonshrink Grout
- 1. Available Products: Provide one of the following products or equal product complying with the specified requirements:
    - a. Burke/Edoco Construction Chemicals: Burke NFNS
    - b. Dayton Superior Chemical Division; Sure-Grip Grout
    - c. Tamms Industries Co.; Horn Grout

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2. Requirements: For grout in exposed to view locations use premixed, nonmetallic, non-corrosive, non-staining grouting compound containing silica sands, portland cement, shrinkage compensating agents and water reducing agents, meeting the requirements of ASTM C 1107-02.

**2.02 FABRICATION:**

- A. Metal Surfaces: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Corten Steel: Pre-rust at job site or factory prior to pouring adjacent concrete paving, or apply rusting agent. Acceptable to not pre-rust where metal walls are installed adjacent to planting areas.
- C. Fabricate and assemble materials in the shop to the greatest extent possible. Perform shearing, flame cutting, and chipping carefully and accurately. Coordinate all connection details to concrete or masonry. Verify all lines, levels, and dimensions, where possible, just before commencing fabrication of connection details. Correct work that does not fit. Schedule and coordinate work under this section with that specified elsewhere in order to produce a workmanlike installation. When not otherwise indicated or specified, comply with applicable requirements of AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings". Finish surfaces of exposed members smooth and free of markings, burrs, or other defects.
- D. Bolt, braze or weld connections as indicated. One-sided or other types of eccentric connections will not be permitted unless indicated, and shown in detail on the shop drawings.
- E. Cut, drill, or punch holes at right angles to the surface of the metal; do not enlarged by burning. Drill holes in base or bearing plates. Provide holes in members to permit connecting the work of other trades.
- F. Galvanizing:
  1. Galvanizing for rolled, pressed and forged steel shapes, plates, bars and strip and for assembled steel products: Zinc coating meeting the requirements of ASTM A 123-02.
  2. Galvanizing for iron and steel hardware: Zinc coating meeting the requirements of ASTM A 153-03.
- G. Shop Painting: Apply shop primer to surfaces of metal fabrications except those which are galvanized or indicated to be embedded in concrete or masonry, unless otherwise indicated.

**2.03 MISCELLANEOUS ROLLED STEEL PLATES AND SHAPES:**

- A. Support Framing for Mechanical and Electrical and Other Equipment: Fabricate of structural steel angles or other shapes as indicated or required, to support the full weight of the equipment. All connections shall be fully welded together.

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- B. Edge and Corner Guards: Fabricate from steel angles and furnish with welded anchors spaced as indicated but not less than 6 feet on centers if not shown.
- C. Shop prime exposed steel surfaces of interior steel items and galvanize exposed steel surfaces of exterior steel items.

**PART 3 - EXECUTION**

**3.01 GENERAL REQUIREMENTS:**

- A. Steel and miscellaneous metal work shall conform with the applicable requirements of the referenced "Codes and Standards". Details indicated are typical, similar details apply to similar conditions. Check drawings for dimensions, elevation, size, and locations of installations. Supply miscellaneous metal items in ample time for incorporation in the work. Include reinforcing angles, plates, straps, brackets, hangers, clips, lugs, holes, sleeves, shims, other hardware as indicated or required for erection of steel and miscellaneous metal work and as required to complete the work as indicated.

**3.02 WELDED CONNECTIONS:**

- A. All welders shall be certified qualified welders. All welders welding light gage metal shall be qualified for light gage metal welding.
- B. Welded connections shall be made in accordance with AWS D1.1-00. All welding shall be done in the shop unless otherwise indicated or specified.
- C. All welds and other connections exposed in the finished work shall be ground and dressed smooth and so that the shape and profile of the item welded is preserved.

**3.03 INSTALLATION:**

- A. Per manufacturer's recommendation and per direction of the project Engineer.

**3.04 GALVANIZED FINISH:**

- A. Touch up all damaged galvanized finish due to installation, welding, threading or other work with treatment specified herein.

**END OF SECTION**

**SECTION 05 50 10**

**ARCHITECTURAL METAL FABRICATIONS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide stock and custom fabricated metal items scheduled at end of this Section, complete in respect to function as intended.
  - 1. Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes, and castings which are not a part of structural steel or metal systems specified elsewhere.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 32 31 20: Decorative metal fences and gates.

**1.2 REFERENCES**

- A. American Welding Society (AWS): D1.1, Structural Welding Code.
- B. National Association of Architectural Metal Manufacturers (NAAMM): Pipe Rail Manual.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Railing Design/Build: Provide special engineering for railings to ensure railings comply with applicable codes and Contract Documents.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature for products used in metal fabrications, including paint, grout, and manufactured items.
- B. Shop Drawings: Submit for fabrication and erection of metal fabrications. Indicate profiles, sizes, connection, reinforcing and anchorage.
  - 1. Provide templates for anchorage installation by others.
- C. Railing Design/Build Certificates: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

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- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide stock and custom fabricated metal items.
- B. Steel Shapes, Plates and Bars: ASTM A36.
- C. Structural Steel Sheet: Hot rolled, ASTM A1011; or cold rolled, ASTM A1008, Class 1; of grade required for design loading.
- D. Steel Pipe: ASTM A53, Type S seamless, grade as selected by fabricator and as required for design loading; minimum standard weight, STD, or Schedule 40.
- E. Steel Tubing: Cold formed ASTM A500; or hot rolled, ASTM A501; minimum Grade B; seamless where exposed.
- F. Castings: Gray iron, ASTM A48, Class 30; malleable iron, ASTM A47.
- G. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron ASTM A47, or cast steel ASTM A27. Provide bolts, washers and shims as required, hot-dipped galvanized, ASTM A153.
- H. Grout: Non-shrink meeting ASTM C1107, non-metallic, pre-mixed, factory-packaged, non-staining, non-corrosive; type specifically recommended by manufacturer as applicable to job condition.
- I. Fasteners and Rough Hardware: Type required for specific usage; provide zinc-coated fasteners for exterior use or where built into exterior walls.
- J. Welding Materials: AWS D1.1, type required for materials being welded.
- K. Paint: Provide primers as recommended by paint manufacturers for substrates and paints specified in Section 09 90 00 – Painting and Coating.
  - 1. Galvanizing Repair Paint: High zinc-dust content paint for regalvanizing welds in galvanized steel.

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**2.2 FABRICATION**

- A. Fabricate items with joints neatly fitted and properly secured.
- B. Grind exposed welds continuous, smooth, and flush with adjacent finished surfaces, and ease exposed edges to approximate 1/32" uniform radius.
- C. Exposed Mechanical Fastenings: Flush countersunk fasteners unobtrusively located, consistent with design of structure.
- D. Fit and shop assemble in largest practical sections for delivery.
- E. Make exposed joints flush butt type, hairline joints where mechanically fastened.
  - 1. Fabricate joints exposed to weather in manner to exclude water or provide weep holes where water could accumulate.
- F. Supply components required for proper anchorage of metal fabrications; fabricate anchorage and related components of same material and finish as metal fabrication.
- G. Railings: Comply with California and ADA Standards access requirements and NAAMM "Pipe Railing Manual"; welded construction; cap exposed ends.
  - 1. Railing Design Requirements: Design railings to support a lateral force of 50 lbs. /lin. ft. uniform load and 200 lbs. at any single point without permanent set or damage; ASTM E935.
    - a. Top Rails: Design to support minimum 300 lb. concentrated single point load applied at any point vertically or horizontally.
  - 2. Regulatory Requirements:
    - a. Access: Comply with California Building Standards Code and Americans with Disabilities Act (ADA) Standards for access for persons with disabilities.
    - b. Code: Comply with requirements of applicable codes for railing design, except where more restrictive codes are specified.
  - 3. Handrails: Seamless steel tube rails, 1-1/2" outside diameter, continuous railings conforming to applicable code and design requirements.
  - 4. Wall Rail Brackets: Castings as approved by Architect.
  - 5. Wall Returns: 90° elbow return with 1/4" maximum clearance unless otherwise indicated.
    - a. Provide wall plates only where indicated and where required by applicable codes.

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- H. Ladders: Comply with requirements of ANSI A14.3 and Cal/OSHA; Contractor option steel or aluminum; interior (roof hatch) and exterior ladders required.
  - 1. Rungs: Fit in centerline of side rails, plug weld, and grind smooth on outer rail faces; provide non-slip surface on top of rung, similar to epoxy resin and aluminum oxide granules surface.
  - 2. Ladder Extensions: Provide 48" ladder extension device for fixed ladders under access hatches and floor doors.
    - a. Manufacturers below, or approved equal:
      - 1) Bilco/LadderUP Safety Post.
      - 2) O'Keeffe's/Safety Post Model SP400.
      - 3) Precision Ladder/Extend-A-Rail.
  - 3. Personal Fall Arrest Systems: Provide system on ladder designed to stop a fall before person contacts a lower level where required for specific ladder applications; system to be acceptable to authorities having jurisdiction.
  - 4. Ladder Security Doors: Nominal 18 gage (0.05") thick metal plate with piano hinge and hasp and staple for Owner furnished padlock; not less than full ladder width, between vertical rails, and 8'-0" high.
- I. Cast-In-Place Concrete Stair Nosing: One-piece cast iron slip-resistant stair nosing, contrasting color to stair treads, 2" nosing full tread width.
  - 1. Provide at each tread and landing for exterior cast-in-place concrete stairs, at upper approach and last tread for interior cast-in-place concrete stairs.
  - 2. Comply with California Building Code Requirements.
- J. Pre-Engineered Support Systems: Provide manufactured pre-engineered support system consisting of channel supports with anchors, attachments, and accessories as required for complete installation. Sizes to support anticipated loads.
  - 1. Manufacturers below, or approved equal:
    - a. Unistrut Inc./Unistrut.
    - b. Grinnell Corp./PowerStrut.
    - c. Thomas & Betts, Inc./Superstrut.
  - 2. Finish: Manufacturer's standard prime paint finish for channel supports; galvanized or similar plated anchors and fasteners; hot dip galvanized where at exterior and exterior exposed applications.
- K. Finishes: Galvanize and prime paint exterior work and prime paint interior work unless otherwise noted in Schedule; comply with requirements of Section 09 90 00 - Painting and Coating for preparation and priming.
  - 1. Thoroughly clean surfaces of rust, scale, grease, and foreign matter prior to applying finish.



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2. Do not shop prime surfaces in contact with concrete or requiring field welding; shop prime in one coat.
3. Galvanized Coating: Provide coating comparable to ASTM A924 and A653, minimum G90 hot dip galvanized coating.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible; do not delay job progress; allow for trimming and fitting where necessary.

**3.2 ERECTION**

- A. Obtain Architect's review prior to site cutting and adjusting which are not part of scheduled work.
  1. Perform cutting and altering for installation and coordination with other work.
- B. Install items square and level, accurately fitted and free from distortion or defects detrimental to appearance or performance.
  1. Supply items required to be cast into or embedded in other materials to appropriate trades.
  2. Ensure alignment with adjacent construction; coordinate with related work to ensure no interruption in installation.
- C. Make provision for erection stresses by temporary bracing; keep work in alignment.
- D. Field bolt and weld to match standard of shop bolting and welding; hide bolts and screws whenever possible, where not hidden, use flush countersunk fastenings.
  1. Perform field welding in accordance with AWS D1.1.
- E. After installation, touch-up field welds and scratched and damaged surfaces; use primer consistent with shop coat or recommended for galvanized surfaces, as applicable.
- F. Replace items damaged in course of installation and construction.

**3.3 SCHEDULE**

- A. Supply and install metal fabrications listed in Schedule, complete with anchorage and attachments necessary for installation.
  1. Schedule lists principal items only, refer to Drawings for items not listed.
- B. Schedule:
  1. Miscellaneous angles, plates, and attachments to be set in concrete or masonry for anchorage of other items.

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2. Iron and steel shapes, sleeves, anchors, connectors, and fastenings required to complete construction work, and which are not provided in other Specification sections.
  - a. Rough hardware, including bolts, fabricated plates, anchors, hangers, dowels, and miscellaneous metals.
  - b. Ledge and shelf angles, channels and plates not attached to structural steel, and for support of metal decking.
  - c. Angle and channel frames for doors and wall openings.
  - d. Beams of structural shapes not supported by structural steel.
3. Guard rails and handrails.
4. Ladders.
5. Cast-in-place concrete stair nosing.
6. Pre-engineered support systems.

**END OF SECTION**

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**SECTION 06 10 00**

**ROUGH CARPENTRY**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Rooftop equipment bases and support curbs.
5. Wood blocking and nailers.
6. Wood sleepers.
7. Plywood backing panels.

**1.2 RELATED REQUIREMENTS:**

- A. Section 01 81 13 Sustainable Design Requirements**

**1.3 ACTION SUBMITTALS**

**A. Product Data:**

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

- B. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.**

**1.4 INFORMATIONAL SUBMITTALS**

**C. Material Certificates:**

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

**D. Evaluation Reports: For the following, from ICC-ES:**

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Shear panels.

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4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

**PART 2 - PRODUCTS**

**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
  1. Refer to Drawings.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  1. Allowable design stresses, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

**2.2 PRESERVATIVE TREATMENT**

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:

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1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

**2.3 DIMENSION LUMBER FRAMING**

- A. As indicated on Drawings.
- B. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
  1. Species and Grade: As indicated on Drawings.

**2.4 ENGINEERED WOOD PRODUCTS**

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Weyerhaeuser Company.
  2. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal-depth members.
  3. Modulus of Elasticity, Edgewise: 2,000,000 psi.
- B. Parallel-Strand Lumber (PSL): Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored in accordance with ASTM D5456, and manufactured with exterior-type adhesive complying with ASTM D2559.
  1. Allowable Stresses:
    - a. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal-depth members.
    - b. Modulus of Elasticity, Edgewise: 2,200,000.

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- C. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D5055.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Weyerhaeuser Company.
  2. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
  3. Structural Properties: Depths and design values not less than those indicated.
  4. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.
- D. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.
1. Manufacturer: Provide products by same manufacturer as I-joists.
  2. Material: product made from any combination solid lumber, wood strands, and veneers.
  3. Thickness: 1-3/4 inches.

2.5 SHEAR WALL PANELS

- A. Wood-Framed Shear Wall Panels: Prefabricated assembly consisting of wood perimeter framing, tie downs, and Exposure I, Structural I plywood or OSB sheathing.

2.6 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
  5. Furring.
  6. Grounds.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

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**2.7 PLYWOOD BACKING PANELS**

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

**2.8 FASTENERS**

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

**2.9 METAL FRAMING ANCHORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Simpson Strong-Tie Co., Inc.
- B. Allowable design loads, as published by manufacturer, are to meet or exceed those of products of manufacturers listed. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.

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2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:

1. Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
2. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
3. Self-adhering sheet consisting of 64mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction.

D. Install shear wall panels to comply with manufacturer's written instructions.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:



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1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

**3.2 PROTECTION**

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION**

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**SECTION 06 16 00**

**SHEATHING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Underlayment.
5. Sheathing joint and penetration treatment.

**1.2 RELATED REQUIREMENTS:**

- A. Section 01 81 13 Sustainable Design Requirements**

**1.3 ACTION SUBMITTALS**

- A. Please refer to section 01 81 13 Sustainable Design Requirements for LEED submittal requirements**

**PART 2 - PRODUCTS**

**2.1 WOOD PANEL PRODUCTS**

- A. Emissions: Products are to meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."**

**2.2 PRESERVATIVE-TREATED PLYWOOD**

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.**
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.**
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.**

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**2.3 WALL SHEATHING**

- A. Plywood Sheathing, Walls: Either DOC PS 1 or DOC PS 2, Exposure 1, Structural I sheathing.
- B. Oriented-Strand-Board Sheathing, Walls: DOC PS 2, Exposure 1, Structural I sheathing.

**2.4 ROOF SHEATHING**

- A. Plywood Sheathing, Roofs: Either DOC PS 1 or DOC PS 2, Exposure 1 sheathing.
- B. Oriented-Strand-Board Sheathing, Roofs: DOC PS 2, Exposure 1 sheathing.

**2.5 SUBFLOORING AND UNDERLAYMENT**

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Underlayment single-floor panels.
- B. Oriented-Strand-Board Combination Subfloor-Underlayment: DOC PS 2, Exposure 1 single-floor panels.
- C. Plywood Subflooring: Either DOC PS 1 or DOC PS 2, Exposure 1 single-floor panels or sheathing.
- D. Oriented-Strand-Board Subflooring: DOC PS 2, Exposure 1 single-floor panels or sheathing.
- E. Underlayment: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.
  - 1. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exposure 1 Underlayment with fully sanded face.

**2.6 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

**2.7 MISCELLANEOUS MATERIALS**

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

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**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL**

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated.
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

**3.2 WOOD STRUCTURAL PANEL INSTALLATION**

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Combination Subfloor-Underlayment:
    - a. Glue and nail to wood framing.
    - b. Space panels 1/8 inch apart at edges and ends.
  - 2. Subflooring:
    - a. Glue and nail to wood framing.
    - b. Space panels 1/8 inch apart at edges and ends.
  - 3. Wall and Roof Sheathing:
    - a. Nail to wood framing.
    - b. Space panels 1/8 inch apart at edges and ends.
  - 4. Underlayment:
    - a. Nail or staple to subflooring.
    - b. Space panels 1/32 inch apart at edges and ends.
    - c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

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**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
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**SECTION 06 20 00**

**FINISH CARPENTRY**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide finish carpentry with accessories as required for complete installation.
  - 1. Provide exterior and interior wood trim.
  - 2. Provide closet and storage shelving.
  - 3. Provide Janitor closet mop holders.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 06 40 00: Architectural woodwork; casework, countertops, and benches.

**1.2 REFERENCES**

- A. North American Architectural Woodwork Standards (NAAWS).

**1.3 SUBMITTALS**

- A. Product Data: Submit literature for manufactured items.
- B. Shop Drawings: Indicate materials and wood species, component profiles, fastening, and joining details, finishes, and accessories.
- C. Samples: Furnish samples of each type of finish carpentry.
- D. Assurance Options: NAAWS certification and monitored compliance programs will not be required for finish carpentry.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
    - a. Wood Product Certification: Furnish certification indicating wood products are from FSC "well-managed" forests.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
    - a. Certified Wood Products: Wood products to be from forests certified “well-managed” by an agency accredited by Forest Stewardship Council (FSC).
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives, sealants, and caulks, and for composite wood products formaldehyde limitations.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver materials until site conditions are adequate to receive work; protect items from weather while in transit.
- B. Store materials indoors, in ventilated areas with constant but minimum temperature of 60-degrees F and maximum relative humidity of 25% to 55%.
- C. Do not begin installation of finish carpentry until space is fully enclosed and mechanical systems are fully operational.
  - 1. Maintain interior installation areas at 70-degrees F and 50% to 55% relative humidity.
- D. Immediately remove from site materials with visible mold and materials with mildew.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide finish carpentry systems specified complying with North American Architectural Woodwork Standards (NAAWS) and including accessories as required for complete installation.
- B. Opaque Painted Exterior Wood Trim:
  - 1. Quality: NAAWS/Custom Grade.
  - 2. Wood: Clear Western Red Cedar.
  - 3. Cut: Mixed Grain.
  - 4. Texture: Surfaced.
- C. Opaque Painted Interior Wood Trim:
  - 1. Quality: NAAWS/Custom Grade.

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2. Wood: Medium density fiberboard (MDF), formaldehyde-free and toxic-free.
  3. Texture: Surfaced.
- D. Wood Shelving: Provide wood board shelves, minimum 3/4" thick.
1. Quality: NAAWS/Custom Grade, for opaque paint finish.
  2. Fixed Wood Shelf Supports: NAAWS/Custom Grade, softwood for opaque finish.
- E. Janitor Closet Mop Holders: Spring loaded anti-slip mop holders with rubber cam, with three mop holders on stainless steel.
1. Manufacturers below, or approved equal:
    - a. Bobrick Washroom Equipment, Inc./Model B-223.
    - b. Bradley Corp./Model 9953.
    - c. American Specialties Inc./Model 0796A.
- F. Anchors, Nails and Screws: Select the material, type, size, and finish required by each substrate for secure anchorage; provide toothed steel or lead expansion bolt screws for drilled-in-place anchors.
- G. Wood Filler: Color to match wood being filled.

## 2.1 FABRICATION

- A. Fabricate finish carpentry items in accordance with specified quality standard.
- B. Use exposed fastening devices or nails only when approved and unavoidable; arrange neatly.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible; do not delay job progress, allow for trimming and fitting.
- B. Verify surfaces are ready to receive work and field measurements are as shown on shop drawings.
  1. Beginning installation signifies acceptance of conditions.
- C. Ensure mechanical and electrical items affecting work are properly placed, complete, and have been inspected by applicable authorities prior to commencement of installation.
- D. Inspect each piece of finish carpentry and discard damaged and defective pieces.

### 3.2 INSTALLATION

- A. Install work consistent with specified NAAWS quality grade, plumb, level, true and straight with no distortions; shim as required, using concealed shims.



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1. Prime paint surfaces in contact with cementitious materials prior to installation; comply with requirements of Section 09 90 00 – Painting and Coating.
- B. Secure work to blocking with countersunk, concealed fasteners and blind nailing as required for complete installation.
- C. Scribe and cut for accurate fit to other finished work.
- D. Install finish carpentry in single, unjointed lengths for openings and for runs less than 10'-0".
  1. For longer runs, use only one piece less than 10'-0" in any straight run; provide scarf joints between members.
  2. Stagger joints in adjacent members.
  3. Cope at returns and miter at corners.
- E. Accessories: Install accessories in accordance with manufacturer's recommendations in locations indicated or as directed by Architect.
- F. Acceptable Tolerances:
  1. Variation from True Position: Maximum 1/16" at any position and maximum 1/8" in any 10'-0" length.
  2. Adjoining Surfaces of Same Material: No variation permitted.
  3. Offset with Abutting Materials: Maximum 1/32".
- G. Preparation for Field Finishing:
  1. Sand work smooth and set exposed nails and screws.
  2. Apply wood filler in exposed nail and screw indentations and leave ready to receive site-applied finishes.
  3. Seal concealed and semi-concealed surfaces; brush apply only, using primer consistent with finish coats specified under Section 09 90 00 – Painting and Coating.

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
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**SECTION 06 40 00**

**ARCHITECTURAL WOODWORK**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide mill fabricated architectural woodwork with accessories as required for complete finished installation including cabinet hardware.
  - 1. Provide custom plastic laminate veneered wood cabinet hardware.
  - 2. Provide quartz-based solid polymer countertops.
  - 3. Provide custom wood benches at Community Room Bay windows.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 06 20 00: Finish carpentry including trim and closet shelving.
  - 3. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. North American Architectural Woodwork Standards (NAAWS).

**1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature for manufactured items.
- B. Shop Drawings: Indicate materials and wood species, component profiles, fastening, joining details, finishes, and accessories.
  - 1. Certification: Provide Woodwork Institute Certified Compliance Label on shop drawings.
- C. Samples: Furnish samples of each exposed finish.
  - 1. Furnish samples of each exposed casework hardware.
  - 2. Furnish samples of wood for benches.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

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- 3. Wood Product Certification: Furnish certification indicating wood products are from FSC “well-managed” forests.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

1.4 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
    - a. Certified Wood Products: Wood products to be from forests certified “well-managed” by an agency accredited by Forest Stewardship Council (FSC).
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives, sealants, and caulks, for composite wood products formaldehyde limitations, and for paints and coatings.
- B. Fabricator Qualifications: Member or Sponsor of North American Architectural Woodwork Standards with minimum five years successful experience fabricating woodwork like that required for Project.
- C. Standards: Perform architectural woodwork in accordance with North American Architectural Woodwork Standards (NAAWS).
  - 1. Certified Compliance Program (CCP): Comply with Woodwork Institute “Certified Compliance Program (CCP) as defined in NAAWS.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver architectural woodwork until site conditions are adequate to receive work; protect items from weather while in transit.
  - 1. Allow architectural woodwork shop finish to completely dry prior to delivery to site; allow materials to off-gas volatile organic compound (VOC) emissions off site.
- B. Store materials indoors, in ventilated areas with constant but minimum temperature of 60-degrees F and maximum relative humidity of 25% to 55%.
- C. Do not begin installation of architectural woodwork until space is fully enclosed and mechanical systems are fully operational.
  - 1. Maintain installation areas at 70 degrees F and 50% to 55% relative humidity.
- D. Immediately remove from site materials with visible mold and materials with mildew.

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**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide mill fabricated architectural woodwork with accessories as required for complete finished installation including cabinet hardware.
- B. Plastic Laminate Finished Casework:
  - 1. Quality: NAAWS/Custom Grade frameless, flush overlay, unless otherwise indicated.
    - a. Special: Provide each single length section of casework in largest such sections as access and openings allow.
      - 1) Multiple self-supporting units fastened together to form larger unit allowed only where access and openings do not allow single lengths.
  - 2. Plastic Laminates:
    - a. Types: NEMA LD-3.1 high pressure laminates.
      - 1) Horizontal Surfaces: General Purpose Type, nominal 0.050".
      - 2) Vertical Surfaces: Vertical Surface Type, nominal 0.032".
      - 3) Unexposed Surfaces: Balanced with 0.030" melamine backing sheet.
    - b. Manufacturers below, or approved equal:
      - 1) Formica Corp.
      - 2) Wilsonart, Wilsonart Engineered Surfaces.
      - 3) Nevamar Corp.
      - 4) Abet Laminati Co.
    - c. Colors: As selected by Architect from manufacturer's full range of available colors and patterns, excluding metallics.
  - 3. Wood Core: Plywood or medium density fiberboard (MDF) or particleboard, with no added formaldehyde and free of toxic materials.
  - 4. Casework Hardware: Provide casework hardware items as required for complete installation as indicated; provide types as listed in North American Architectural Woodwork Standards for casework, but no less than following types.
    - a. Adjustable Shelf Standards and Supports: Match BHMA A156.9 B04073 adjustable standards and B04083 closed shelf rest brackets for mortis mounting; flush mounted in cabinet.
    - b. Cabinet Hinges: BHMA A156.9 B01602 or B01603 frameless European concealed type, minimum 160 degree opening, with spring closer.
    - c. Cabinet Pulls: As indicated, as directed by Architect where not indicated.

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- d. Drawer Slides: Full extension, rail mounted type, minimum 100 lb. capacity with ball-bearing rollers; self-closing.
  - e. Cabinet Locks: Pin and tumbler slide bolt lock with five pin tumblers as approved by Architect, two keys each.
- C. Quartz-Based Solid Polymer Countertops: Manufacturer's standard quartz-based polymer system with color throughout thickness; provide manufacturer recommended joint adhesive; exposed surfaces finished to match top.
- 1. Manufacturers below, or approved equal:
    - a. CaesarStone USA/CaesarStone.
    - b. Silestone USA/Silestone Countertops.
    - c. DuPont Co./Corian Quartz (formerly Zodiaq).
    - d. Daltile/One Quartz Surfaces.
  - 2. Quality: NAAWS/Premium Grade.
  - 3. Type: Not less than 1/2" thick sheet; coordinate with bowls as indicated and as specified in Division 22.
  - 4. Color: Manufacturer's standard color as selected by Architect.
- D. Transparent/Stained Finished Benches:
- 1. Quality: NAAWS/Premium Grade, solid wood; veneering not permitted.
  - 2. Wood: As indicated and approved by Architect.
  - 3. Texture: Surfaced.
- E. Anchors, Nails and Screws: Select material, type, size, and finish required by each substrate for secure anchorage; provide toothed steel or lead expansion bolt screws for drilled-in-place anchors.
- F. Wood Filler: Color to match wood being filled.

## 2.2 FABRICATION

- A. General: Fabricate architectural woodwork in accordance with specified North American Architectural Woodwork Standards.
- B. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Make corners and joints hairline; slightly bevel arises.
  - 1. Locate butt joints at least 2'-0" from cutouts.
  - 2. Cap exposed edges with plastic laminate of same finish and pattern.
  - 3. Apply laminate backing sheet to reverse side of laminate surfaces.
  - 4. Provide cutouts for inserts, fixtures, and fittings; verify locations from on-site dimensions.

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5. Prime paint contact surfaces of cutouts.
- C. Countertops: Provide maximum sizes available. Locate butt joints at least 2'-0" from cutouts where more than one-piece countertops are required.
  1. Make corners and joints hairline; slightly bevel arises.
  2. Provide cutouts for inserts, fixtures, and fittings; verify locations from on-site dimensions.
  3. Splashes and edges as indicated or as directed by Architect where not otherwise indicated.
- D. Use exposed fastening devices or nails only when approved and unavoidable; arrange neatly.
- E. Assemble woodwork in shop in sizes easily handled and to ensure passage through building openings.

### 2.3 FINISHES

- A. Transparent/Stained Finished Woodwork: Finish architectural woodwork in shop unless otherwise indicated.
  1. Wood: As indicated on Drawings; match Architect samples.
  2. Sand work smooth; seal, stain and varnish concealed and semi-concealed surfaces of transparent/stained finished woodwork; brush apply.
  3. Transparent/Stained Finish: NAAWS/Premium Grade water-based polyurethane finish producing a dull rubbed effect, as approved by Architect.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible; do not delay job progress, allow for trimming and fitting.

### 3.2 INSTALLATION

- A. Install work consistent with North American Architectural Woodwork Standards specified quality grade, plumb, level, true and straight with no distortions.
  1. Shim as required, using concealed shims.
- B. Ensure mechanical and electrical items affecting architectural woodwork are properly placed, complete, and have been inspected by Architect prior to commencement of installation.

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- C. Secure work to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation except where otherwise required by NAAWS.
- D. Scribe and cut for accurate fit to other finished work.
- E. Install architectural woodwork under supervision of factory-trained mechanics.
- F. Attach architectural woodwork securely in place with uniform joints providing for thermal and building movements.
- G. Acceptable Tolerances:
  - 1. Variation from True Position: Maximum 1/16" at any position and maximum 1/8" in any 10'-0" length.
  - 2. Adjoining Surfaces of Same Material: No variation permitted.
  - 3. Offset with Abutting Materials: Maximum 1/32".

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
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**SECTION 07 13 00**

**SHEET WATERPROOFING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide self-adhesive sheet membrane waterproofing system, including sealing joints and protrusions through waterproofing, with protective board, drainage composite covering, and accessories for complete watertight installation.
  - 1. Provide at exterior surface of foundation walls.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 28 00: Weather barrier/underlayment including sheet membranes.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature for waterproofing system and protection board.
- B. Shop Drawings: Indicate flashings, joints, sealing at openings, projections, and waterproofing of holes, slots, and sleeves.
- C. Certificates: Submit manufacturer's representative's certification work has been installed in accordance with manufacturer's recommendations.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.



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- B. Qualification of Installers: Minimum five years' successful experience in projects of similar scope.

**1.4 SITE CONDITIONS**

- A. Do not apply waterproofing during inclement weather or when air temperature is below 40 degrees F, except where specifically authorized by manufacturer's representative for specific materials.
- B. Do not apply waterproofing to damp, dirty, dusty, or otherwise unsuitable surfaces.
  - 1. Allow concrete surfaces to cure for a minimum 28 days.

**1.5 WARRANTY**

- A. Extended Correction Period: Provide for correcting failure of system to resist water penetration except where failure is result of structural failure of building. Repair system and pay for or replace damaged materials and surfaces.
  - 1. Hairline cracking due to temperature or shrinkage is not structural failure.
  - 2. Period: Two years.
- B. Manufacturer's Warranty: Submit manufacturer's warranty including special manufacturer services as required for manufacturer's warranty.
  - 1. Period: 5 years.
  - 2. Manufacturer's warranty shall not detract from requirements of extended correction period nor from Owner's rights under implied and expressed warranties regardless of wording of manufacturer's warranty.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers listed below, or approved equal:

- A. GCP Applied Technologies (Grace) /Bituthene 3000 or 4000 Waterproofing System.
- B. Carlisle Coatings and Waterproofing/CCW Miradri Waterproofing.

**2.2 MATERIALS**

- A. System Description: Provide sheet membrane waterproofing system including sealing joints and protrusions through waterproofing, protective covering, and accessories.
- B. Regulatory Requirements: Provide materials conforming to applicable air quality management district limitations on volatile organic compound (VOC) emissions.

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- C. Waterproofing System: System consisting of sheet membrane of rubberized asphalt and polyethylene film, total thickness approximately 60 mil, and fluid applied rubberized asphalt for sealing system.
  - 1. Low Temperature Applications: Where temperatures are between 25 degrees F and 40 degrees F, use manufacturer's special membrane and primer for low temperature applications.
- D. Primer: Manufacturer's recommended primer of applications involved; primer is required for waterproofing applications.
- E. Crack and Expansion Joint Sealants: Types as recommended by waterproofing system manufacturer, compatible with waterproofing system.
- F. Protective Covering:
  - 1. Protection Board (Where Exposed): Preformed 1/4" thick asphalt impregnated board or similar protective cover recommended by waterproofing manufacturer.
  - 2. Drainage Composite (Below Grade): Formed plastic with filter fabric designed to allow penetration and drainage of water while retaining silts, soils, and similar particulate matter; type recommended by manufacturer for application.
    - a. Manufacturers listed below, or approved equal:
      - 1) Grace/Hydroduct Drainage Composite.
      - 2) Carlisle/CCW MiraDRAIN.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Prepare surfaces in accordance with manufacturer's recommendations.
- B. Ensure sleeves, curbs and projections which pass through waterproofing are properly and rigidly installed.
- C. Ensure surfaces are free of cracks, depressions, waves, and projections which may be detrimental to proper installation of waterproofing.
  - 1. Repair surfaces as required by manufacturer's representative.
- D. Seal cracks and expansion joints with recommended backup material and sealant; ensure proper depth-width ratio as recommended by sealant manufacturer.
- E. Ensure expansion joints are sharply formed, free of broken edges and loose aggregates.
- F. Clean surfaces of dust, dirt, and foreign matter detrimental to proper installation of waterproofing.
- G. Prime surfaces to receive waterproofing in accordance with manufacturer's recommendations.

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**3.2 INSTALLATION**

- A. Apply waterproofing in accordance with manufacturer's recommendations and installation instructions as required for watertight installation.
  - 1. Seal joints and items projecting through waterproofing.
- B. Seam Overlap: Minimum 2-1/2".
  - 1. Stagger end laps.
- C. Reinforce corners with double applications of waterproofing unless otherwise specifically recommended by manufacturer's representative.
- D. Allow extra materials at joints with anticipated movement to permit movement without stressing waterproofing.
- E. Roll waterproofing membrane smooth, firmly, and completely to surfaces indicated, with no fish-mouths or bunches of material.
- F. Inspect and repair waterproofing in accordance with manufacturer's instructions prior to application of protection board and backfill.
- G. As soon as possible after installation and inspection apply protection boards and drainage composites in accordance with manufacturer's recommendations.
  - 1. Neatly fit around pipes and penetrations.

**3.3 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Manufacturer's representative shall inspect work of Project and provide certification waterproofing has been installed in accordance with manufacturer's recommendations.
  - 1. Provide unobstructed access to waterproofing work.
  - 2. Correct defects and irregularities as advised by manufacturer's representative.

**END OF SECTION**

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**SECTION 07 19 00**

**WATER REPELLENT**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide clear liquid penetrating type water repellent coating.
  - 1. Location: Apply water repellent to following exterior exposed surfaces.
    - a. Architectural concrete walls and steps.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 09 30 00: Tile assembly sealers.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this Section. Require attendance of those directly affecting work of this Section.
  - 1. Review installation procedures and coordination required with related work.

**1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature.
- B. Samples: Submit sample units with water repellent coating applied to half of each sample face; indicate which half has coating.
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for paints and coatings.
- B. Qualification of Installers: Firm with minimum five years' successful experience in projects of similar scope.
- C. Mock-Up: Prior to commencing work, including bulk purchase and delivery of material, prepare small application in unobtrusive location of typical substrate in manner acceptable to Architect.

**1.5 SITE CONDITIONS**

- A. Do not apply coating during inclement weather, when air temperature is below 50-degrees F, or when rain or temperatures below 40-degrees F are predicted for a period of 24 hours.
- B. Do not apply coating earlier than 3 days after surfaces became wet.
- C. Do not apply coating to damp, dirty, dusty, or otherwise unsuitable surfaces.
  - 1. Allow concrete surfaces to cure minimum 28 days unless otherwise approved in writing by coating manufacturer.
- D. Protect glass, glazed products, and landscaping from contact with water repellent coating; replace materials damaged by water repellent coating.

**1.6 WARRANTY**

- A. Extended Correction Period: Provide for correcting failure of water repellent coating to resist penetration of water.
  - 1. Period: Two years.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. ProSoCo/Sure Klean SL 100.

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- B. BASF Master Builders/MasterProtect H 1000 System.
- C. Chemprobe Products Industries Inc./CP-500W.

**2.2 MATERIALS**

- A. System Description: Provide silane or siloxane based clear liquid water repellent coating which does not affect appearance of coated material.
- B. Performance Requirements: Provide products which are recommended by manufacturer to be fully compatible with indicated substrates and joint sealers which are in contact with water repellent coating.
- C. Regulatory Requirements: Provide material with maximum volatile organic compound (VOC) emissions as required by applicable codes and regulations.
  - 1. Comply with applicable air quality management authority.
- D. Water Repellent Coating: Manufacturer's standard penetrating type silane or siloxane-based sealers specified conforming to applicable limitations on volatile organic compounds.
  - 1. Provide specific systems as recommended by manufacturer for substrates involved.
  - 2. Finish: Water repellent coating shall not alter appearance, color, or texture of substrate under any lighting conditions.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Prepare substrates and apply coating in strict accordance with manufacturer's recommendations.
- B. Clean surfaces of dust, dirt, and foreign matter detrimental to proper installation of water repellent coating.
- C. Assure coating compatibility with each type of joint sealer within or adjacent to surfaces receiving waterproof coating.
  - 1. Mask surfaces indicated to receive joint sealers which would be adversely affected by coating.

**3.2 APPLICATION**

- A. Apply coating in accordance with manufacturer's instructions including maximum allowable coverage.
- B. Take special care to prevent damage to adjacent materials from application of coating; repair or replace materials damaged due to application of coating.

**END OF SECTION**

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**SECTION 07 21 00**

**THERMAL INSULATION**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide insulation and accessories as required for complete installation.
  - 1. Provide thermal batt insulation.
  - 2. Provide extruded polystyrene thermal insulation.
  
- B. Related Work:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 54 25: Insulation integral with elastomeric TPO membrane roofing.

**1.2 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature for each type of insulation.
  - 1. Submit Underwriter's Laboratory approval numbers for required fire ratings. Approvals of other laboratories contingent upon acceptance of applicable authorities.
  
- B. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
  
- C. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

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- a. Comply with requirements including those relative to energy efficiency.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide thermal insulation with accessories.
- B. Thermal Batt Insulation: Preformed slag mineral wool with thermosetting resin binders, conforming to ASTM C665; formaldehyde-free.
  1. Manufacturers below, or approved equal:
    - a. Owens-Corning Corp./Thermafiber UltraBatt Insulation.
    - b. Rockwool/Comfortbatt Insulation.
  2. R-Value: Minimum R-19 unless otherwise indicated.
  3. Flame Spread/Smoke Developed Rating: Maximum 25/450, ASTM E84.
  4. Vapor Retarder: Type I, no vapor retarder.
  5. Combustibility: Pass ASTM E136.
- C. Polystyrene Insulation: ASTM C578, extruded polystyrene (XPS) insulation with skin surface; square edges; "K" factor of 0.20.
  1. Manufacturers below, or approved equal:
    - a. DuPont/Styrofoam XPS ST-100.
    - b. Owens Corning/Foamular NGX.
    - c. Kingspan/XPS GreenGuard LG.
  2. R-Value: Nominal R-5 at 1" thickness; thicknesses as indicated.
  3. Compressive Strength (Below Slabs): Not less than 175-psf.
- D. Accessories: Furnish as recommended by insulation manufacturer for insulation types, substrates, and conditions involved.
  1. Fasteners and Attachment Devices: Comply with insulation manufacturer recommendations for attachment of insulation.
  2. Fasteners to withstand loads specified for system.



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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify substrate and adjacent materials are dry and ready to receive insulation; beginning installation signifies acceptance of conditions.
- B. Ensure mechanical and electrical items affecting work are properly placed, complete, and have been inspected by Architect prior to commencement of installation.

**3.2 INSTALLATION**

- A. General: Install insulation in accordance with manufacturer's instructions and applicable code requirements. Cut and trim insulation neatly, to fit spaces.
  - 1. Fit insulation tight within spaces and tight to and behind mechanical and electrical services within insulation plane; leave no gaps or voids; maintain integrity of thermal barrier.
- B. Batt Insulation: Friction fit batt insulation in place; use supports as necessary to assure permanent installation.
- C. Polystyrene Insulation Installation: Comply with manufacturer recommendations and installation instructions for insulation for use in systems indicated.

**END OF SECTION**

**SSECTION 07 25 00**

**WEATHER-RESISTIVE BARRIERS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide weather-resistive barrier/underlayment air and water barrier systems for siding, soffits and wood slats, flashing and sheet metal, and penetrations with accessories as required for complete watertight installation.
1. Wall Underlayment: Provide vapor permeable self-adhering sheet underlayment and flashing for exterior wall applications, with related concealed metal flashings and accessories as required for complete airtight and watertight installation.
  2. Soffits with Wood Slat Underlay: Provide vapor permeable self-adhering underlayment with black face (no printing), and ultra-violet protection, with accessories as required for complete airtight and watertight installation.
  3. Flashings and Sheet Metal Underlay: Provide self-adhering sheet membrane underlayment at flashings and sheet metal, with accessories as required for complete watertight installation.
  4. Penetrations: Provide flashing for around penetrations through underlayment including but not limited to windows, doors, louvers, vents, piping, and conduit, with accessories as required for complete watertight installation.
    - a. System: By same manufacturer as underlayment; system may be either fluid-applied or sheet membrane as recommended by underlayment manufacturer.
- B. Related Sections:
1. Section 01 81 13: Sustainable Design Requirements.
  2. Section 07 46 20: Wood siding rainscreen barrier.
  3. Section 07 60 00: Exposed metal flashing.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Weather Barriers: Provide weather-resistive barrier/underlayment systems which, with other building components, comply with applicable code requirements for air barriers and water barriers.
1. Air Barriers: Air barriers shall be as defined by applicable Energy Code requirements and shall include standard exterior wall components and air seal joint sealants specified in Section 07 90 00 – Joint Sealants.
  2. Water Barriers: Water barriers shall be as defined by applicable Building Code requirements and shall include vapor permeable systems with or without rainscreen barriers intended to extend amount of water drained to exterior.

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3. Penetrations: Intent of sealing window openings, door openings, and other penetrations through underlayment is to ensure water cannot move from exterior surface past water barriers and into building.
  - B. Pre-Installation Meeting: Convene one week prior to commencing work; require attendance of parties directly affecting underlayment.
    1. Review procedures and coordination required with related work.
  - C. Coordination: Coordinate air and water barrier systems with adjacent materials and assemblies to ensure material compatibility, sequencing, and air and watertight installation is achieved especially related to terminations, transitions, and penetrations.
- 1.3 SUBMITTALS
- A. Product Data: Furnish manufacturer's literature for each type of underlayment.
  - B. Samples: Furnish samples of each material.
  - C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
    1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
    2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
  - D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

1.4 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives and fluid-applied materials (coatings).

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1.5 WARRANTY

- A. Extended Correction Period: Provide for correcting failure of system to resist damage from anticipated sources including damage from water penetration. Repair system and pay for or replace damaged materials and surfaces.
  - 1. Period: Two years.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- A. System Description: Provide weather-resistive barrier/underlayment air and water barrier systems for siding, soffits and wood slats, flashing and sheet metal, and penetrations with accessories.
- B. Regulatory Requirements: Provide materials conforming to applicable air quality management district limitations on volatile organic compound (VOC) emissions.
- C. Wall Underlay: Provide vapor permeable water and air barrier type self-adhering sheet underlayment system for complete watertight installation as recommended by manufacturer for substrates and applications indicated.
  - 1. Manufacturers below, or approved equal:
    - a. GCP Applied Technologies (Grace)/Perm-A-Barrier VPS Self-Adhering Sheet.
    - b. Henry Company/Blueskin VP160 Self-Adhered Air and Weather Barrier.
    - c. Carlisle Corp./CCW 705 VP.
- D. Soffits with Wood Slat Underlay: Provide vapor permeable self-adhering underlayment with black face (no printing), and ultra-violet protection, with accessories as required for complete airtight and watertight installation.
  - 1. Manufacturers below, or approved equal:
    - a. VaproShield USA/VaproShield System.
    - b. DuPont/Tyvek UV Façade System.
- E. Sheet Metal and Flashing Underlay: Self-adhering rubberized sheet membrane with primers and seam sealers as required for complete watertight installation; type as recommended by manufacturer for substrate and for applications indicated.
  - 1. Manufacturers below, or approved equal:
    - a. GCP Applied Technologies (Grace).
    - b. Henry Company.
    - c. Carlisle Corp.
  - 2. Provide specific membrane types as recommended by system manufacturers for each type of application.
    - a. Copings and Gutters: Provide manufacturer's high temperature resistant material comparable to GCP/Ice and Water Shield HT with service temperature up to 260-degrees F.

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- F. Penetrations: Provide flashing at penetrations with accessories for complete watertight installation; type as recommended by manufacturer for substrate and for applications indicated. System to be compatible with adjacent underlayment materials.
  - 1. Manufacturers: Provide penetration flashing by underlayment manufacturer.
  - 2. Provide specific membrane types as recommended by system manufacturers for each type of application.
- G. Concealed Metal Flashings Integral with Underlay: Minimum 26 gage thick steel with minimum 0.90 oz/sf galvanized coating; ASTM A653.
  - 1. Fasteners: Standard round wire type of hot dipped galvanized steel; minimum 19/64" head diameter and 0.104" shank diameter; minimum 7/8" long.
- H. Bituminous Paint: Acid and alkali resistant type; black color.
- I. Accessories: Provide as recommended by underlayment manufacturers for specific applications.
  - 1. Concealed Sealant at Metal Flashing: Butyl type for use in conjunction with sheet metal; non-staining; non-corrosive; non-shrinking and non-sagging; ultra-violet and ozone resistant for exterior concealed applications.

## 2.2 FLASHING FABRICATION

- A. Fabricate metal flashings as recommended by Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "Sheet Metal Manual".
- B. Form flashings to drain water to exterior at roofing and siding construction for penetrations, sill, and header flashings.
- C. Form sections square, true and accurate to size, in maximum possible lengths and free from distortion and other defects detrimental to appearance or performance.
- D. Hem exposed edges of metal flashings minimum 1/4" on underside.
- E. Apply bituminous paint on concealed surfaces of metal flashings.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Comply with underlayment manufacturer recommendations for examination and preparation of substrates to receive underlayment.
- B. Install underlayment over surfaces that are dry, free of ridges, warps and voids that could damage underlayment.
- C. Coordinate installation with installation of components and items projecting through underlayment.

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**3.2 FLASHINGS INSTALLATION**

- A. Install flashings as recommended by Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "Sheet Metal Manual".
- B. Weatherlap joints minimum 2", seal with plastic cement, and secure in place.
- C. Fastenings: Concealed in completed installation.

**3.3 UNDERLAYMENT INSTALLATION**

- A. Install weather-resistive barrier in accordance with installation instructions and recommendations of each manufacturer and of manufacturers of products to cover weather-resistive barrier; comply with applicable code requirements.
  - 1. Wall Underlay: Provide one-layer sheet membrane underlayment.
  - 2. Wood Slat Soffit Underlay: Provide one-layer sheet membrane underlayment.
  - 3. Flashing and Sheet Metal: Provide one-layer sheet membrane underlayment.
  - 4. Penetrations: Apply penetration flashing extending minimum 18" from penetrations, including windows and doors; start at bottom of penetration and weatherlap.
    - a. Apply over metal flashing to direct water to exterior.
  - 5. Weatherlap joints as recommended by system manufacturer.
  - 6. Secure underlayment in place, stagger joints between sheet membrane layers; lap ends minimum 6"; stagger end joints.
- B. Sheet Membranes: Weatherlap items projecting through sheet membrane underlayment and seal with sealer recommended by sheet membrane underlayment manufacturer.
- C. Fluid Applied Membrane (Penetrations Option): Prime substrates when recommended by system manufacturer and apply using methods to ensure dry film thickness complies with manufacturer recommendations for each application.

**END OF SECTION**

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**SECTION 07 26 00**

**BELOW-GRADE VAPOR RETARDER**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Provide vapor retarder system for below grade and slab-on-grade concrete, including sealing joints and protrusions through vapor retarder.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's literature.
- B. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- C. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

1.3 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

1.4 SITE CONDITIONS

- A. Do not apply vapor retarder during inclement weather or when air temperature is below 40 degrees F.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

Manufacturers below, or approved equal:

- A. Fortifiber Corp./Ultra 15.

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- B. Raven Industries, Inc./Vapor Block # VB 15 (15 mil Blue).
- C. Stego Industries, Inc./Stego Wrap (15 mil).
- D. W.R. Meadows/Perminator (15 mils).

**2.2 MATERIALS**

- A. System Description Includes: Provide vapor retarder system for below grade and slab-on-grade concrete, including sealing joints and protrusions through vapor retarder.
- B. Vapor Retarder: ASTM E1745, Class A vapor retarder consisting of 15 mil polyolefin film.
  - 1. Permeance: Maximum 0.025 perms, ASTM F1249 and E154 tests.
  - 2. Resistance to Puncture: Minimum 2200 grams, ASTM D1709, Method B.
  - 3. Tear Resistance: Minimum 8.74 lbs., ASTM D1004.
  - 4. Tensile Strength: Minimum 35 lbs/in., ASTM E154, Section 9, Method D-882, in both directions.
- C. Joint Sealer: Pressure sensitive tape as recommended by vapor retarder manufacturer and providing comparable permeance to vapor retarder.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Ensure sleeves, curbs and projections that penetrate vapor retarder are properly and rigidly installed.
- B. Ensure substrate is free of projections and irregularities that may be detrimental to proper installation of vapor retarder.

**3.2 INSTALLATION**

- A. Apply vapor retarder in accordance with manufacturer's recommendations and installation instructions and in accordance with ASTM E1643; comply with most restrictive where conflicts occur.
  - 1. Seal perimeters and items projecting through vapor retarder with pressure sensitive tape.
- B. Seams: Minimum 12" overlap, sealed with pressure sensitive tape for vapor tight seal.
- C. Lay vapor retarder membrane smooth with no fish-mouths or bunches of material.
- D. Inspect and repair vapor retarder prior to application of concrete slab; tape tears and repair damage.

**END OF SECTION**



**SECTION 07 46 20**

**WOOD SIDING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide wood board siding and wood board soffits with accessories as required for complete weathertight installation.
  - 1. Provide rainscreen barrier beneath exterior wood siding.
  - 2. Provide interior wood board siding indicated to match exterior wood board siding.
  
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 06 20 00: Exterior wood trim.
  - 3. Section 07 25 00: Weather barrier/underlayment.
  - 4. Section 09 54 20: Manufactured wood ceilings including soffits.
  - 5. Section 09 96 20: Graffiti Resistant Coating.
  - 6. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. Lumber Standard: PS-20, American Softwood Lumber Standard.
  
- B. General Grading Rules: Western Wood Products Association (WWPA) grading rules and inspection.
  
- C. North American Architectural Woodwork Standards, (NAAWS).

**1.3 SUBMITTALS**

- A. Shop Drawings: Clearly indicate general construction, configurations, jointing methods, and locations, fastening methods and locations and installation details.
  - 1. Indicate where exposed fasteners will be required.
  
- B. Samples: Provide samples of each type of wood siding and soffit.
  
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

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3. Wood Product Certification: Furnish certification indicating wood products are from “well-managed” forests.

D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.

1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.

a. Certified Wood Products: Wood products to be from forests certified “well-managed” by an agency accredited by Forest Stewardship Council (FSC).

2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

a. Comply with requirements including those relative to finish material pollution control for composite wood products formaldehyde limitations.

B. Qualification of Installer: Firm with not less than five years’ successful experience with similar size and type projects.

**1.5 PRODUCT HANDLING**

A. Store siding materials to prevent warping and weather damage; elevate on level blocking; covering shall permit adequate ventilation.

B. Acclimatize siding to site by storing outside on job site minimum five days prior to installation.

**1.6 WARRANTY**

A. Extended Correction Period: Extend correction period to two years.

1. Repair or replace defective siding that fails through corrosion or finish damage because of manufacturing defects.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

A. System Description Provide both board siding and plywood siding, including plywood soffits with accessories.

B. Design Criteria: Custom pieces shall conform to Architectural Woodwork Standards (AWS).

C. Board Siding: Board siding and soffits, S1S2E, vertical grain; to be opaque painted.

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1. Board Sizes: Nominal 1x6 and 1x8 boards in patterns indicated.
  2. Wood and Grade: Western Red Cedar, minimum WWPA grade marked Clear Vertical Grain Heart, Certified Kiln Dried; do not use pieces with knots.
  3. Basis of Design Lap Siding: Buffalo Lumber Co./Channel Rustic Lap Siding, or approved equal.
  4. Basis of Design Tongue and Groove Siding and Soffit: Buffalo Lumber Co./Tongue and Groove Siding, or approved equal.
- D. Custom Pieces: Match siding.
1. Fabrication: Comply with North American Architectural Woodwork Standards (NAAWS) requirements for not less than Custom Grade exterior trim.
- B. Rainscreen Drainage System: Provide system that allows moisture entering wall from exterior and condensation within wall to travel downward and exit wall area.
1. Manufacturers below, or approved equal:
    - a. Basis of Design: Benjamin Obdyke/Slicker HP Rainscreen.
- E. Nails: Corrosion resistant nonmagnetic stainless-steel siding nails; minimum 10d where over sheathing.
- F. Accessories: Provide as required for complete finished siding installation.
2. Provide inside and outside corners as indicated on Drawings, as directed by Architect where not otherwise indicated.
  3. Provide other components required for complete, finished siding and soffit systems; match siding and soffits unless otherwise indicated.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Install wood siding and soffits over surfaces which are dry, free of ridges, warps, and voids.
- B. Coordinate installation of siding with installation of items projecting through; ensure openings are properly sized and located prior to siding installation.
- C. Underlayment: Take special care not to damage underlayment beyond that required to secure wood siding to structure.
- D. Rainscreen: Install rainscreen over underlayment prior to installation of wood siding and in accordance with rainscreen manufacturer recommendations for application indicated.

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**3.2 INSTALLATION**

- A. Install siding in accordance with manufacturer's instructions, North American Architectural Woodwork Standards (NAAWS), and as required to match patterns as indicated on Drawings.
- B. Avoid face nailing on siding, conceal fasteners when possible.
  - 1. Power Driven Staples: Not permitted.
- C. Board Siding and Soffits: Leave slight gap for sealant at trim and corners; stagger joints in subsequent courses.
- D. Custom Pieces: Install as required for complete, weathertight system; comply with North American Architectural Woodwork Standards (NAAWS).

**3.3 CLEANING**

- A. Clean marks, debris, and dirt from exposed surfaces of mineral-fiber units using manufacturer recommended cleaning materials and procedures which do not stain nor damage panels or fasteners.

**END OF SECTION**

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**SECTION 07 54 25**

**ELASTOMERIC TPO MEMBRANE ROOFING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide reinforced thermoplastic polyolefin (TPO) type elastomeric sheet membrane roofing system with base flashings, insulation, roof deck board, and accessories for complete, weather-tight installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 60 00: Flashing and sheet metal.

**1.2 REFERENCE STANDARDS**

- A. National Roofing Contractors Association: The NRCA Roofing and Waterproofing Manual.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this section. Require attendance of parties directly affecting roofing work.
  - 1. Review procedures and coordination required with related work.

**1.4 SUBMITTALS**

- A. Product Data: Submit membrane manufacturer's literature for membrane and base flashing materials; provide specific recommendations of insulation system manufacturer.
  - 1. Submit membrane manufacturer's recommendations for surface conditioning, flashing, joint cover and crack sealants, and temperature range for application of materials.
- B. Shop Drawings: Submit for elastomeric membrane seams, insulation and roof deck board layout; indicate location and insulation type; provide cross section indicating layers of insulation along with R-value calculations.
- C. Samples: Submit samples of each exposed material.
- D. Certifications:
  - 1. Installer: Submit certification installer is approved for roof system installation.
  - 2. Materials: Submit certification materials and components conform to Specifications and are compatible with each other, roof substrate, and related work.

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3. Fire and Wind: Submit manufacturer's certification system conforms to fire and wind requirements.
  4. Manufacturer Representative: Submit certification by manufacturer's representative indicating work has been installed in accordance with manufacturer's recommendations and installation instructions.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to energy efficiency.
- B. Qualification of Installers: Company with minimum five years successful experienced in TPO membrane roof application on projects of similar scope.
1. Installer: Roofing and insulation manufacturer certified or approved.
- C. Supervisor: Installer to maintain full-time supervisor/foreman who is on jobsite during roofing work who is experienced in installation of roofing system specified.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protect foam insulation from direct sunlight exposure.

**1.7 SITE CONDITIONS**

- A. Do not apply roofing membrane during inclement weather or when air temperature may fall below 40 degrees F.
1. Do not allow materials to be exposed to moisture during transportation, storage, handling, or installation.

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2. Mark damp or wet materials, including felts which froth or foam during installation, and remove from site within 24 hours.
- B. Do not apply materials to damp, dirty, dusty, or otherwise unsuitable surfaces.
  1. Allow concrete surfaces to cure for a minimum 28 days.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

**1.8 WARRANTY**

- A. Extended Correction Period: Provide for correcting failure of system to resist damage from anticipated sources including damage from wind and water penetration. Repair system and pay for or replace damaged materials and surfaces.
  1. Period: Two years.
- B. Manufacturer's Warranty: Submit manufacturer's warranty including special manufacturer services as required for manufacturer's warranty.
  1. Period: 20 years.
  2. Manufacturer's warranty shall not detract from requirements of extended correction period nor from Owner's rights under implied and expressed warranties regardless of wording of manufacturer's warranty.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Johns Manville Roofing Systems.
- B. Carlisle SynTec Systems.
- C. Firestone Building Products Co.
- D. GenFlex Roofing Systems Division GenCorp.
- E. GAF.

**2.2 MATERIALS**

- A. System Description: Provide reinforced thermoplastic polyolefin (TPO) type elastomeric sheet membrane roofing system with base flashings, insulation, roof deck board, and accessories.
  1. System: Fully adhered exposed membrane.
  2. Provide roofing system materials by a single manufacturer, except where materials of other manufacturers are specified or approved by Architect.

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3. Provide roof insulation, double layer application where indicated.
4. Provide tapered insulation as required to ensure positive 1/4" per foot slopes to drains.
5. Provide roof deck board to separate insulation from roof membrane.

**B. Regulatory Requirements**

1. Cool Roof System: Comply with California Building Standards Code requirements for "Cool Roof" system including three-year aged solar reflectance value requirements.
  - a. Label: System to have Cool Roof Rating Council (CRRC) label.
2. Fire and Wind Resistance: Conform to California Building Standards Code requirements for Underwriters Laboratory (UL) Class A roof system, with UL Class 60 wind resistance classification.

**C. Roof Membrane: ASTM D6878, Thermoplastic Polyolefin (TPO) membrane, reinforced, type and thickness as recommended by roof membrane manufacturer for application involved, but no less than 80 mils.**

1. System: Comply with NRCA Specification Guide for Thermoplastic Roof Membranes.
2. Provide materials compounded specifically for application methods and substrates indicated on Drawings; comply with requirements for fire rated materials.

**D. Insulation: Provide materials approved for use with specified membrane and suitable for application indicated; provide tapered insulation where insulation is indicated to provide roof slopes.**

1. Polyisocyanurate Insulation: ASTM C1289, Type II, Class 1, Grade 2 glass fiber faced isocyanurate, with ASTM C1303 Long Term Thermal Resistance (LTTR).
2. Other Types of Insulation: Acceptable subject to manufacturer's recommendations, application involved, and total thickness required for specified thermal resistance.
3. Thermal Resistance: Minimum total R-30.

**E. Roof Deck Board: ASTM C1278 with moisture and mold resistant core. Provide as indicated, as required for uniform surface for membrane adherence, and as required for fire and wind ratings.**

1. Manufacturers below, or approved equal:
  - a. Georgia Pacific/DensDeck Prime.
  - b. USG/Securock Ultralight Coated Glass-Mat.
  - c. Johns Manville/Securock.



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- F. Accessories: Provide as recommended by membrane manufacturer and system manufacturer as required for complete weather-tight installation, including, but not limited to:
1. Unreinforced thermoplastic polyolefin membrane flashing.
  2. Bonding adhesive.
  3. Splicing cement.
  4. Lap sealant.
  5. Water cut-off mastic.
  6. Molded pipe flashing.
  7. Temporary sealing, for end of day closing of membrane.
  8. Pourable sealer.
  9. Nailing strips.
  10. Fasteners.
- G. Roof Protection Pads: Provide protection materials as recommended by membrane manufacturer where maintenance traffic is anticipated over membrane.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Verify deck is dry, clean, and smooth, free of depressions, waves, and projections detrimental to roofing membrane, and properly sloped for drainage.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set and that cant strips, nailing strips, and reglets are in place.
- C. Beginning installation indicates acceptance of substrate.
- D. Metal Surfaces: Remove contaminants which may adversely affect adhesion or performance of roofing system; apply metal primer.

**3.2 INSTALLATION**

- A. Install membrane roofing system in accordance with manufacturer's recommendations and instructions and as required to meet requirements for warranty and applicable codes.
1. Comply with NRCA Specification Guide for Thermoplastic Roof Membranes as applicable. Where conflicts exist comply with manufacturer's recommendations.
- B. Insulation: Install insulation in accordance with insulation manufacturer's recommendations and roof membrane manufacturer's recommendations for installation indicated.
1. Place insulation boards butted in close contact and stagger joints between insulation board layers.
  2. Bevel insulation to allow snug fit at penetrations; cut neatly around protrusions through roof.

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- C. Roof Deck Board: Install in accordance with manufacturer recommendations and as required to ensure suitable substrate for membrane roofing over insulation, fire ratings, and wind ratings; secure to roofing deck.
  - 1. Place roof deck boards butted in close contact and stagger joints between roof deck board and insulation board joints.
  - 2. Cut to allow snug fit at penetrations; cut neatly around protrusions through roof.
- D. Roof Membrane: Apply membrane in accordance with membrane manufacturer's recommendations and installation instruction. Provide heat welded seams.
  - 1. Apply sheet membrane smooth, free from air pockets, wrinkles, fish-mouths, unlapped joints, or tears, over first layer insulation.
  - 2. Extend roof membrane up vertical surfaces minimum 8" wherever possible and secure to nailing strips or reglets; reinforce corners with double applications of membrane.
  - 3. Install membrane flashings and seal into membrane.
    - a. Coordinate installation of roof drains and related flashings.
  - 4. Seal flashings and items projecting through membrane; seal terminations with additional layer of membrane and mastic.
- E. Roof Protection Pads: Secure roof protection pads in place in accordance with membrane manufacturer recommendations and as required to ensure protection of membrane from roof maintenance traffic.
  - 1. Set pads to allow roof drainage. Where pads cross drainage path set with not less than 4" and not more than 8" between pads.

### 3.3 FIELD QUALITY CONTROL

- A. Site Tests: Flood test roofing prior to installation of insulation and ballast; if defects are revealed, repair and repeat flood test until no defects are revealed.
  - 1. Do not overload structure with flood test; if necessary, section off as necessary.
  - 2. Test for leaks with 2" depth of water maintained for 24 hours.
- B. Manufacturer's Field Services: Manufacturer's representative shall inspect work of Project on regular basis and provide certification roofing system has been installed in accordance with manufacturer's recommendations.
  - 1. Provide unobstructed access to roofing work.
  - 2. Correct defects and irregularities as advised by manufacturer's representative.

### 3.4 CLEANING

- A. Remove roof membrane markings from finished surfaces.

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- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by roofing work, consult manufacturer of finished surfaces for recommended cleaning methods.
- C. Leave completed roof free from debris and uniform in appearance.

**END OF SECTION**

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**SECTION 07 60 00**

**FLASHING AND SHEET METAL**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide metal flashings and sheet metal including accessories as required for complete weathertight installation.
  - 1. Flashing and sheet metal includes copings, fascia, scuppers, gutters, downspouts, rainwater leaders, reglets, rain chains, and similar fabricated components as applicable to Project.
  - 2. Provide concealed sealants used in conjunction with installation of metal flashing and sheet metal.
  - 3. Provide miscellaneous sheet metal flashing and reglets not provided by other trades or suppliers.
    - a. Where reglets are to be installed in conjunction with other work provide in adequate time for installation.
  - 4. Provide precast concrete splash blocks.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 25 00: Concealed flashing at weather barrier/underlayment.
  - 3. Section 07 41 15: Flashing and sheet metal integral with metal roofing.
  - 4. Section 08 91 00: Louvers.
  - 5. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

**1.3 SUBMITTALS**

- A. Product Data: Furnish literature for manufactured products.
- B. Shop Drawings: Clearly indicate dimensioning, layout, general construction details including closures, flashings, locations and types of sealants, anchorages, and method of anchorage.
- C. Samples: Furnish samples of typical metal flashing fabrication indicating standard soldered joints and edge conditions.

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- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

**1.5 WARRANTY**

- A. Extended Correction Period: Provide for correcting failure of system to resist damage from anticipated sources including damage from wind and water penetration. Repair system and pay for or replace damaged materials and surfaces.
  - 1. Period: Two years.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide flashing and sheet metal including reglets and accessories as required for complete weathertight installation.
- B. Design Criteria: Allow for movement of components without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to 100-year seasonal temperature ranges.
- C. Flashing and Sheet Metal:
  - 1. Galvanized Steel: ASTM A924 and A653 G90 galvanized steel; minimum 24-gage.
    - a. Mill phosphatized where indicated to be field painted.
  - 2. Accessories: Provide strainers, outlet tubes, screens, baffles, hangers, and gutter ends as required for a complete system and complying with SMACNA Manual.

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3. Provide heavier gage metal where recommended by SMACNA Manual for size of component.
- D. Manufactured Reglets: Snap-on type, for two-piece flashing; metal to match flashing and sheet metal.
  1. Manufacturers below, or approved equal:
    - a. Fry Reglet Corp./Springlok System.
    - b. W.P. Hickman Co./The Leading-Edge Drive Lock System.
- E. Rain Chains: Galvanized steel linked chain with links consisting of nominal 1/4" wire formed into nominal 1-1/4" welded links; chain size as required to allow secure installation with chain fixed at gutter and as indicated at grade.
- F. Solder and Fasteners: As recommended by SMACNA and complying with applicable codes and regulations; hot dipped galvanized minimum coating comparable to G90.
- G. Concealed Sealant: Butyl type for use in conjunction with sheet metal; non-staining; non-corrosive; non-shrinking and non-sagging; ultra-violet and ozone resistant for exterior concealed applications.
- H. Bituminous Paint: Acid and alkali resistant type; black color; asbestos free.
- I. Plastic Cement: Cutback asphaltic type; asbestos free.
- J. Sealing Compound: Type recommended by roofing manufacturer; asbestos free.
- K. Splash Blocks: Precast concrete of size and profile as approved by Architect; minimum 2000 psi at 28 days with minimum 5% air entrainment.

## 2.2 FABRICATION

- A. Fabricate sheet metal in accordance with SMACNA Architectural Sheet Metal Manual.
- B. Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
  1. Fabricate corners and intersections in shop with solder joints for watertight fabrication.
- C. Form sections in maximum 10'-0" lengths; make allowance for expansion at joints.
- D. Hem exposed edges on underside 1/2".
- E. Back-paint flashings with heavy bodied bituminous paint where in contact with cementitious materials or dissimilar metals.

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**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Comply with SMACNA Architectural Sheet Metal Manual recommendations for examination and preparation of substrates to receive flashing and sheet metal.
- B. Install flashing and sheet metal over surfaces that are dry, free of ridges, warps and voids that could damage underlayment.
- C. Coordinate installation with installation of underlayment specified in Section 07 28 00 – Weather Barrier/Underlayment; take special care not to damage underlayment beyond that required to secure flashing and sheet metal in place.

**3.2 INSTALLATION**

- A. Install metal flashing and sheet metal in accordance with SMACNA Architectural Sheet Metal Manual.
  - 1. Install tight in place, with corners square, surfaces true and straight in planes, and lines accurate to profiles as indicated on Drawings.
  - 2. Lap joints in direction of water flow.
  - 3. Hold downspouts in position, clear of wall, by hangers spaced not more than 10'-0" on center; securely fasten hangers to wall without exposed damage to wall surface.
- B. Exercise care when cutting materials on site, to ensure cuttings do not remain on finished surfaces.
- C. Provide expansion joints concealed within system.
- D. Use concealed fasteners, continuous cleat type, except where specifically approved by Architect.
  - 1. Exposed fasteners may be used, where clearly indicated on shop drawings and approved by Architect, at areas not exposed at exterior walls nor in sight of interior spaces.
- E. Apply sealing compound at junction of metal flashing and felt flashing.
- F. Lock seams and end joints; fit flashing tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- G. Counter-flash mechanical and electrical items projecting through roof membrane.
- H. Install sealants where required to prevent direct weather penetration.
- I. Completed installation shall be free of rattles, noise due to thermal and air movement, and wind whistles.
- J. Install splash blocks at locations to interrupt fall of water and direct water flow as indicated on Drawings.

**END OF SECTION**

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**SECTION 07 72 00**

**ROOF HATCHES**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Provide manufactured roof hatches with integral support curb, operable hardware, counterflashing, and accessories as required for complete, weather-tight installation.
  - 1. Provide fall protection railings where indicated and as required by applicable regulations.
- B. Related Sections:
  - 1. Section 05 50 00: Ladder extenders for roof hatch access.
  - 2. Section 07 60 00: Flashing roof hatches to roof system.

1.2 SUBMITTALS

- A. Product Data: Furnish manufacturer's literature.
- B. Shop Drawings: Clearly indicate general construction, configurations, jointing methods, and locations when applicable, fastening methods and general details.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

Manufacturers below, or approved equal:

- A. Bilco Company.
- B. Babcock-Davis Hatchways, Inc.
- C. Dur-Red Products, Red Plastic Co., Inc.
- D. Milcor, Inc.
- E. Nystrom Building Products.

2.2 ROOF HATCHES

- A. System Description: Provide manufactured roof hatches, with integral support curb, operable hardware, counterflashing, and accessories.
- B. Roof Hatches:
  - 1. Basis of Design: Bilco/Type S Thermally Broken, or approved equal.
  - 2. Size: 2'-6" by 3'-0" unless otherwise indicated.



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- C. Construction: Construct with full welded corner joints, insulated hatch lids, and insulated internal support curbs.
  - 1. Provide complete with integral counter-flashings to roof flashing system and flanges on support curb for anchorage to roof deck.
  - 2. Loading: Capable of supporting minimum 40-psf external loading and 20-psf internal loading pressure.
- D. Opening Hardware: Manufacturer's standard manually operating type.
  - 1. Capable of ensuring effortless control and smooth operation without causing damage to hatch or to roofing system.
  - 2. Capable of being opened from inside and outside.
  - 3. Complete with hold-open mechanism and inside padlock hasps.
- E. Fall Protection Integral Railings: Provide railings fixed to roof hatch curbs (not requiring additional penetration of roof assembly); comply with applicable code requirements; welded construction; cap exposed ends.
  - 1. Railing Design Requirements: Comply with applicable codes and regulations requirements but not less than lateral force of 50 lbs. /lin. ft. uniform load and 200 lbs. at any single point without permanent set or damage; ASTM E935.
  - 2. Rails: Seamless steel tube rails, 42" height above roof surface, 1-1/2" outside diameter, continuous railings conforming to applicable code and design requirements.
  - 3. Chain Closures: Provide welded closed link chain or comparable closure capable of supporting same loads as railing and designed to allow easy removal for access from hatch to roof and roof to hatch.

**2.3 FABRICATION**

- A. Fabricate roof hatches weather-tight, and free of visual distortions and defects.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install roof hatches in accordance with manufacturer's recommendations and instructions for complete, weather-tight installation.
- B. Coordinate with installation of roofing system and related flashings.
- C. Apply bituminous paint on metal surfaces of roof hatches to be in contact with cementitious materials and dissimilar metals.

**END OF SECTION**

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**SECTION 07 90 00**

**JOINT SEALANTS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide joint sealants, for interior and exterior joints not specified elsewhere, with backing rods and accessories as required for complete installation.
  - 1. Joint sealants include joint sealers and caulking as indicated.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 60 00: Flashing and sheet metal concealed sealants.
  - 3. Section 08 80 00: Glazing sealants.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: System requires coordination of sealants with multiple substrates, some required to accept bond, some required to prevent bond.
  - 1. It shall be responsibility of this Section to ensure substrates are suitable for providing bond or preventing bond as required for proper sealant installation and longevity.
  - 2. Where substrates are not suitable provide materials as required to ensure bond such as primers and to prevent bond such as bond-breakers.
  - 3. Coordinate with Architect where change of detail or sealant type is required to ensure proper sealant installation.
- B. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this Section. Require attendance of those directly affecting work of this Section.
  - 1. Review installation procedures and coordination required with related work.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's descriptive literature.
- B. Samples: Furnish samples of each type of exposed joint sealer in required colors.
- C. Certifications:
  - 1. Furnish manufacturer's certification joint sealers comply with Contract Documents and are suitable for Project applications.
  - 2. Furnish certification indicating installers are trained in proper use of specified products, qualified, and familiar with proper installation techniques.

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- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives, sealants, and caulks.
    - b. Provide joint sealants as required by applicable codes and regulations to fill joints and openings in building envelope separating conditioned space from unconditioned space.
- B. Installer Qualifications: Firm with minimum five years' successful experience on projects of similar type and size, using specified products.
  - 1. Installers shall be familiar with proper application procedures to ensure maximum joint sealer expansion and contraction capabilities.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, cure time, and mixing instructions.

**1.6 SITE CONDITIONS**

- A. Do not proceed with installation of joint sealers under unfavorable weather conditions.
- B. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer.

**1.7 WARRANTY**

- A. Extended Correction Period: Extend correction period to two years.

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1. Repair or replace joint sealers which fail to perform as intended, because of leaking, crumbling, hardening, shrinkage, bleeding, sagging, staining, loss of adhesion, and loss of cohesion.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide joint sealants with backing rods and accessories.
- B. Performance Requirements:
  1. Select materials for compatibility with joint surfaces and indicated exposures.
  2. Where not indicated, select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.
  3. Comply with applicable limitations on volatile organic compound (VOC) emissions.
- C. Regulatory Requirements: Comply with applicable regulatory requirements regarding limitations on volatile organic compound (VOC) emissions limitations.
- D. Elastomeric Sealants:
  1. Single Component Low Modulus Silicone Sealant: ASTM C920 Type S, Class 25, Grade NS; minimum 50% expansion and compaction capability.
    - a. Provide at exterior locations not exposed to traffic.
    - b. Manufacturers below, or approved equal:
      - 1) GE (Momentive Performance Materials)/Silpruf, Silglaz or GESIL.
      - 2) Dow/Dowsil 790 or Dowsil 795.
      - 3) Pecora Corp./864 Architectural Silicone.
      - 4) Tremco/Spectrem 3.
  2. Multi-Component Polyurethane Sealant: ASTM C920, Type M, Grade P, Class 25, self-leveling; minimum 25% expansion and compaction capability.
    - a. Provide at traffic bearing locations.
    - b. Manufacturers below, or approved equal:
      - 1) Pecora Corp./Urexpan NR-200, or Dynatrol II-SG.
      - 2) Tremco/THC 900-901, or Vulkem 445 SSL.
      - 3) BASF/MasterSeal SL 2

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3. Mildew-Resistant Silicone Rubber Sealant: ASTM C920, Type S, Grade NS, Class 25, compounded with fungicide, specifically for mildew resistance and recommended for interior joints in wet areas.
  - a. Provide at interior joints in wet areas.
  - b. Manufacturers below, or approved equal:
    - 1) GE (Momentive Performance Materials)/SCS 1702 Sanitary Sealant.
    - 2) Dow/786 Bathtub Caulk.
    - 3) Pecora Corp./898 Sanitary Mildew Resistant Sealant.
    - 4) Tremco/Tremsil 200.

**E. Non-Elastomeric Sealants:**

1. Acrylic-Emulsion Sealant: ASTM C834 acrylic or latex-rubber-modified acrylic sealant, permanently flexible, non-staining, and non-bleeding; recommended for general interior exposure; compatible with paints specified in Section 09 90 00.
  - a. Provide at general interior applications.
  - b. Manufacturers below, or approved equal:
    - 1) Pecora Corp./AC-20.
    - 2) Tremco/Tremflex 834.
2. Air Seals: Provide non-staining and non-bleeding sealers, calks, or foams appropriate to specific applications for filling openings between conditioned and unconditioned spaces.
  - a. Type: As recommended by manufacturer for each specific application; compatible with adjacent materials.
  - b. Manufacturers below, or approved equal:
    - 1) Dow/Great Stuff.
    - 2) Owens Corning/EnergyComplete Air Sealant.
    - 3) Hilti/Foam Filler CF 812.
  - c. Pest Control Mesh: Openings subject to pest infiltration to have 304 stainless steel wool, material stuffed in joint before application of air seals using methods to ensure blocking of gap from pests.
  - d. Exception: Annular spaces around pipes, electric cables, conduits, and other openings in exterior walls shall be protected against passage of rodents by closing with cementitious grout.
    - 1) Cementitious Grout: ASTM C1107 non-shrink, non-metallic, pre-mixed, factory-packaged, non-staining, non-corrosive; type specifically recommended by manufacturer as applicable to job condition.

**F. Miscellaneous Materials:**

1. Primers/Sealers: Non-staining types recommended by joint sealer manufacturer for joint surfaces to be primed or sealed.

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2. Joint Cleaners: Non-corrosive types recommended by joint sealer manufacturer; compatible with joint forming materials.
  3. Bond Breaker Tape: Polyethylene tape as recommended by joint sealer manufacturer where bond to substrate or joint filler must be avoided for proper performance of joint sealer.
  4. Sealant Backer Rod: Closed cell compressible polyethylene foam rod or other flexible, permanent, durable non-absorptive material as recommended by joint sealer manufacturer for compatibility with joint sealer.
    - a. Oversize backer rod minimum 30% to 50% of joint opening.
- G. Colors: As indicated, as selected by Architect from manufacturer's full range of colors where not indicated.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Prepare joint surfaces in accordance with ASTM C1193 and as recommended by joint sealer manufacturer.
- B. Clean joint surfaces immediately before installation of joint sealer; remove dirt, insecure materials, moisture, and other substances which could interfere with bond of joint sealer.
- C. Prime or seal joint surfaces when recommended by joint sealer manufacturer; do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- D. Ensure protective coatings on surfaces in contact with joint sealers have been completely stripped.

**3.2 INSTALLATION**

- A. Comply with manufacturer's printed instructions and ASTM C1193, except where more stringent requirements are shown or specified.
- B. Pest Control: Install stainless steel wool prior to application of backer rods and bond breakers at air seal and as required to ensure complete pest blockage at joints where pest intrusion is a potential.
- C. Set sealant backer rods at proper depth or position in joint to coordinate with other work, including installation of bond breakers and sealant; do not leave voids or gaps between ends of backer rods.
  1. Do not stretch, twist, puncture, or tear backer rods.
- D. Install bond breaker tape as required to avoid three-sided bond of sealant to substrate and where required by manufacturer's recommendations to ensure joint sealers will perform properly.
- E. Size materials to achieve required width/depth ratios.

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- F. Employ installation techniques that will ensure joint sealers are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of bond surfaces equally on opposite sides.
- G. Joint Configuration: Fill sealant joint to a slightly concave surface, slightly below adjoining surfaces, unless otherwise indicated.
- H. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture or dirt.
- I. Install joint sealers to depths recommended by joint sealer manufacturer but within the following general limitations, measured at center (thin) section of bead.
  - 1. Horizontal Joints: 75% width with minimum depth of 3/8".
  - 2. Elastomeric Joints: 50% width with minimum depth of 1/4".
  - 3. Non-Elastomeric Joints: 75% to 125% of joint width.
- J. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces.
  - 1. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- K. Cure joint sealers in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength, and surface durability.
- L. Maintain finished joints free of embedded matter, ridges, and sags.

**END OF SECTION**

**SECTION 08 11 10**

**HOLLOW METAL DOORS AND FRAMES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide full flush steel (hollow metal) doors and pressed steel frames, including anchors and silencers.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 08 14 00: Wood doors.
  - 3. Section 08 71 00: Door hardware.

**1.2 REFERENCES**

- A. Steel Door Institute (SDI): SDI-100 (ANSI/SDI A250.8) - Recommended Specifications - Standard Steel Doors and Frames.
- B. National Association of Architectural Metal Manuf. (NAAMM): Hollow Metal Manual.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate hardware installation with Section 08 71 00 – Door Hardware.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturers' literature.
- B. Shop Drawings: Indicate general construction, configuration, jointing methods, reinforcement, anchorage methods, hardware locations, and locations of cut-outs.
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.



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2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Amweld Building Products Inc.
- B. Ceco Door Division Assa Abloy Door Group.
- C. Curries Division Assa Abloy Door Group.
- D. Door Components, Inc.
- E. Republic Doors and Frames.

**2.2 MATERIALS**

- A. System Description: Provide full flush steel (hollow metal) doors and pressed steel frames, including anchors and silencers.
- B. Doors: Hollow metal flush steel door, 1-3/4" thick.
  1. Typical: Full flush with steel channel or welded edge; close top with flush end closer treatment, bottom optional flush, or recessed channel; steel stiffened core, insulated at exterior doors; continuous welded seam.
  2. Interior Doors: Minimum 0.042" (18-gage).
  3. Exterior Doors: Minimum 0.053" (16-gage).
- C. Frames: Welded (pre-assembled) type, minimum 0.053" (16-gage) interior frames, 0.067" (14-gage) exterior frames.
  1. Door Silencers: Manufacturer's standard resilient type; removable for replacement.
  4. Mortar Guard Boxes: Minimum 0.026" (22-gage) mortar guard boxes welded in place; provide where frames may be grouted.

**2.3 FABRICATION**

- A. Conform to requirements of SDI (ANSI A250 Series) or NAAMM.
- B. Reinforce and prepare doors and frames to receive hardware.
  1. Refer to Section 08 71 00 for hardware requirements.
- C. Welded Frames: Accurately form and cut mitered corners of welded type frames; continuously weld on inside surfaces (fully welded); grind welded joints to smooth uniform finish.

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1. Head Reinforcement: Reinforce frames wider than 4'-0" with minimum 0.093" (12 gage) formed steel channels welded in place, flush with top of frames.
- D. Door Silencers:
1. Place three single bumpers on single door frames; space equally along strike jambs.
  2. Place two single bumpers on double door frames; place on frame heads.
- E. Provide jamb anchors per SDI-100 (ANSI/SDI 250.8) and NAAMM and weld floor jamb anchors in place.
- F. Provide double doors without astragals.
- G. Edge Clearances:
1. Between Doors and Frames: Maximum 1/8" at head and jambs.
  2. Door Sills (No Threshold): Maximum 1/2".
  3. Door Sills (Threshold): Maximum 3/8" above finished floor.
  4. Between Edges of Pairs of Doors: Maximum 1/8".
- H. Finish: Comply with requirements of Section 09 90 00 – Painting and Coating for primer including application and compatibility with specified finishes.
1. Interior Units: Prime paint.
  2. Exterior Exposed Units: Apply minimum A60 non-spangle galvanized coating, ASTM A924 and A653.
    - a. Surface treat after galvanizing to remove oils and prepare for painting and apply one coat of primer; comply with requirements in Section 09 90 00.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install doors and frames in accordance with SDI-100 (ANSI/SDI A250.8) and ANSI/SDI A250.11 or NAAMM "Hollow Metal Manual" and with manufacturer's recommendations and installation instructions.
- B. Install doors and frames plumb and square within 1/16", and with maximum diagonal distortion of 1/32".
- C. Remove and replace doors and frames damaged during delivery, storage, installation, and construction.
  1. Paste filler repair shall not be permitted.
- D. After installation, touch-up scratched paint surfaces.

**END OF SECTION**

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**SECTION 08 14 00**

**WOOD DOORS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide exterior and interior exposed wood doors as indicated.
  - 1. Provide French type (glazed stile and rail) wood doors.
  - 2. Contractor Option: Provide shop finished wood doors.
- B. Related Work
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 08 11 10: Pressed steel frames.
  - 3. Section 08 41 00: Entrances and storefronts including frames for wood doors.
  - 4. Section 08 71 00: Door hardware.
  - 5. Section 08 80 00: Glass and glazing for wood doors.

**1.2 REFERENCES**

- A. North American Architectural Woodwork Standards (NAAWS).
- B. Window and Door Manufacturer's Association (WDMA): Guide Specifications.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Hardware: Coordinate hardware installation with Section 08 71 00 – Door Hardware.
  - 2. Glazing: Coordinate glazing with Section 08 80 00 – Glazing.
  - 3. Painting: Coordinate with Section 09 90 00 – Painting and Coating whether wood doors are to be shop finished or field painted.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature.
- B. Shop Drawings: Indicate general construction, jointing methods, hardware locations, and locations of cut-outs.
- C. Samples: Submit samples of wood doors indicating construction, veneering, and finish.
  - 1. Submit corner section of each type of door indicated as stained finished.
  - 2. Submit corner section of wood panel (French) door.
  - 3. Submit shop finish for wood doors where doors are furnished shop finished.

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- D. Certificates: Submit manufacturer certification indicating compliance to applicable requirements of either NAAWS or WDMA Standards; note which standards were followed or if both standards have been met.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
  - 3. Wood Product Certification: Furnish certification indicating wood products are from FSC “well-managed” forests.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
    - a. Certified Wood Products: Wood products to be from forests certified “well-managed” by an agency accredited by Forest Stewardship Council (FSC).
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for composite wood products formaldehyde limitations and paints and coatings.

**1.6 SITE CONDITIONS**

- A. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized in accordance with referenced standards requirements applicable to Project location.

**1.7 WARRANTY**

- A. Extended Correction Period: Provide for replacing, rehung, and refinishing wood doors exhibiting defects in materials or workmanship including warp and delamination.
  - 1. Period: Two years.

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**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide wood doors as indicated.
- B. French (Glazed Stile and Rail) Doors: NAAWS/Premium Grade, configurations as indicated on Drawings; 1-3/4" thick; Contractor option to use WDMA comparable standards.
  - 1. Manufacturers below, or approved equal:
    - a. VT Industries including Eggers.
    - b. Masonite Architectural including Marshfield.
    - c. Pinecrest.
    - d. Simpson Door Co.
  - 2. Stained Finished Solid Wood: NAAWS/Premium Grade solid wood.
    - a. Wood: Types as indicated, as directed by Architect where not otherwise indicated.
  - 3. Design: As indicated and conforming with WDMA Design Group matching indicated configurations.
  - 4. Panel Type: Glazed panels unless otherwise indicated.
  - 5. Bond Type: Provide Type I Bond for exterior doors, Type II Bond for interior doors.

**2.1 FABRICATION**

- A. Fabricate doors in accordance with requirements of specified standards.
  - 1. Prefit wood doors.
  - 2. Prepare doors to receive hardware in shop, refer to Section 08 71 00 for hardware requirements and templates.
  - 3. Factory machine doors for mortise hardware.
- B. Bevel strike edge of single-acting doors, 1/8" in 2".
- C. Provide matching wood stops for glass; profiles as indicated, type as selected by Architect where not otherwise indicated.
- D. Shop Finished Doors (Contractor Option): Conform to requirements specified in Section 09 90 00 – Painting and Coating.

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**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install wood doors in accordance with manufacturer's recommendations and installation instructions, and reference standards, plumb and square, and with maximum diagonal distortion of 1/16".
- B. Rehang or replace doors which do not swing or operate freely.

**3.2 PROTECTION**

- A. Protection: Protect doors as recommended by door manufacturer to ensure doors are without damage at time of substantial completion.
  - 1. Shop Finished Doors: Refinish or replace damaged doors.

**END OF SECTION**

**SECTION 08 31 00**

**ACCESS DOORS AND PANELS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide access doors set in finished surfaces.
  - 1. Provide access doors and panels as required for access to controls and valves behind finished surfaces.
  - 2. Coordinate with various trades for controls and valves which may be concealed.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.

**1.2 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature.
- B. Shop Drawings: Indicate locations of access doors required but not indicated on Architectural Drawings.
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

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**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Nystrom Building Products.
- B. J.L. Industries.
- C. Karp Associates, Inc.

**2.2 MATERIALS**

- A. System Description: Provide access doors and panels set in finished surfaces.
- B. Access Doors and Panels: Provide access door and panel assemblies consisting of an integral unit with flush metal doors and panels, complete and ready for installation.
  - 1. Type: Flush panel access doors; provide type with frame flange concealed in finished construction.
- C. Frames: Fabricate from not less than 16 gage steel.
- D. Doors: Flush panel type, fabricate from not less than 14 gage steel.
- E. Hinges: Provide continuous piano type hinge.
- F. Locking Devices: Provide flush, key-operated cylinder lock for each access door; provide two keys per lock and key locks alike, unless otherwise scheduled.
- G. Finish: Finish with manufacturer's factory-applied enamel prime coat applied over phosphate coating on steel.

**2.3 FABRICATION**

- A. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.
- B. Fabricate units of continuous welded steel construction, grind welds smooth and flush with adjacent surfaces.
- C. Provide attachment devices and fasteners of type required for specific job conditions.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine areas and conditions under which access doors are to be installed.
  - 1. Do not proceed with work until unsatisfactory conditions are corrected; installation signifies acceptance of conditions.



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- B. Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, coordinate installation with work of other trades.

**3.2 INSTALLATION**

- A. Comply with manufacturer's installation instructions for access doors.
- B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.
- C. Adjust hardware and doors after installation for proper operation.

**3.3 PROTECTION**

- A. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

**END OF SECTION**

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**SECTION 08 35 50**

**FOLDING STOREFRONT**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide folding aluminum and glass storefront with hardware, anchorage, glazing, and accessories as required for complete installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 90 00: Perimeter sealants and back-up materials.
  - 3. Section 08 41 00: Entrances and storefronts.
  - 4. Section 08 71 00: Key cylinders.
  - 5. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. American Architectural Manufacturers Association/National Wood Window and Door Association, AAMA/NWWDA 101/I.S.2: Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
- B. Glass Association of North America (GANA): Glazing Manual.
- C. National Assoc. of Architectural Metal Manuf. (NAAMM): Metal Finishes Manual.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Design/Build: Provide special engineering to ensure compliance with applicable codes and Contract Documents.
- B. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this Section. Require attendance of those directly affecting work of this Section.
  - 1. Review installation procedures and coordination required with related work.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature.
- B. Shop Drawings: Indicate pertinent dimensioning, general construction, component connections and locations, anchor methods and locations, hardware locations, and relevant details.
- C. Samples: Furnish samples of metal finish, glass and glazing gasket.
- D. Design/Build Certificates: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.

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- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – LEED Certification Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to energy efficiency.

**1.6 WARRANTY**

- A. Special Warranty: Provide for correcting failures including wind damage and water penetration to interior surfaces, excessive deflections, and deterioration of finishes, weatherstripping and accessories.
  - 1. Special Warranty Period: Two years.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

- A. Basis of Design: NanaWall Systems, Inc. Mill Valley, CA. (800.873.5673)/SL70 Folding Systems.
- B. Approved equal

**2.2 MATERIALS**

- A. System Description: Provide folding aluminum and glass storefronts with hardware, anchorage, glazing, and accessories.
- B. Performance Criteria Requirements: Conform to ANSI/AAMA 101 for HGD-R20 rating or better.
  - 1. Strength: Design system to withstand wind loads acting normal to plane of storefronts as required by California Building Code but no less than following minimum requirements:

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- a. Wind Loads: Minimum 20-psf acting inward and outward.
  - b. Deflection: Maximum L/175, ASTM E330.
  - c. Safety Factor: Design for specified pressures with no glass breakage, no permanent damage to fasteners, and no permanent deformation of framing exceeding 0.2% of member clear span.
- C. Regulatory Requirements, General: Comply with applicable California Building Code load requirements, without breakage, failure of any part, or malfunction of operation.
- D. Regulatory Requirements for Glazing: Comply with California Building Code, CPSC 16 CFR 1201, and pass ANSI Z97.1.
- E. California Title 24 CEC Regulatory Requirements: Comply with California Energy Commission requirements regarding energy performance of storefronts.
- 1. Manufacturer shall be responsible for providing information required by authorities necessary to verify conformance.
  - 2. Entire assembly, including glass and glazing, shall be certified by National Fenestration Rating Council (NFRC) and shall bear NFRC Label indicating energy performance technical information.
- F. Accessibility Regulatory Requirements: Provide for assuring access for persons with disabilities in accordance with state and federal regulations.
- 1. California Regulations: Comply with California Building Standards Code.
  - 2. Federal Regulations: Comply with Americans with Disabilities Act (ADA) Standards.
- G. Folding Aluminum and Glass Storefronts: System with profiles as indicated on Drawings; provide extruded aluminum security type glass stops of profile to suit frame design.
- 1. Aluminum Type: As recommended by manufacturer for application indicated, but not less than extruded aluminum, ASTM B221, 6061 or 6063 alloy and T5 or T6 temper.
  - 2. Finish: Manufacturer's standard powder coat finish matching Classic Bronze Anodized coating conforming to NAAMM Metal Finishes Manual.
- H. Hardware: Barrier-free folding storefront system meeting code requirements for providing access for people with physical disabilities; by system manufacturer.
- 1. Metal and Finish: Match storefront system.
  - 2. Hardware: Provide manufacturer's complete standard hardware system except as indicated; match folding storefront finish unless otherwise indicated.
    - a. Panic Device: Comply with requirements specified in Section 08 71 00 – Door Hardware for panic device general requirements; provide panic device hardware suitable for application to folding storefront system as indicated.

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- b. Cylinders: Provided under Section 08 71 00.
  - c. Flat Handles: Stainless-steel with black titanium finish.
  - d. Hinges: Powder coat finish; color to match powder coat Classic Bronze Anodized finish of storefront aluminum framing.
  - e. Sill: Thermally broken sill, low profile, with dark bronze anodized finish.
- I. Glass: Coordinate glazing with folding storefront system.
- 1. Manufacturers below, or approved equal:
    - a. Vitro Architectural Glass (formerly PPG).
    - b. Oldcastle Glass.
    - c. Guardian Industries Corp.
  - 2. Glass Type GL-1, Insulated Glass: Preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space with minus 20-degree F dew point.
    - a. Performance: ASTM E2190 certified Insulating Glass Certification Council.
    - b. System: Manufacturer's standard dual seal system compatible with glazing system, and including spacers, desiccant, and standard corner construction.
    - c. Glass: Provide low iron glass comparable to Vitro/Starphire glass.
      - 1) Float Glass (Typical): Select glazing quality, clear float glass, ASTM C1036; nominal thickness 1/4".
      - 2) Tempered Glass (Where Indicated and Where Safety Glazing is Required): Select glazing quality, clear float glass, fully tempered, ASTM C1048, Kind FT; nominal thickness 1/4"; safety glass.
      - 3) Bird Friendly Glass: Provide bird friendly glass acid etch pattern on Number 1 surface comparable to Vitro/AviProtek E, Pattern 217.
      - 4) Low Emissivity Coating: Provide high performance low e coating comparable to Vitro/Solarban 72 on No. 2 surface.
    - d. Total Unit Thickness: 1".
- J. Glazing Accessories: Of type recommended by manufacturer to suit security locations and applications for dry glazing installation.
- 1. Setting Blocks: Neoprene or EPDM, 80-90 Shore A durometer hardness; 4" long by 3/8" thick by 1/4" high; ASTM C864.
  - 2. Spacer Shims: Neoprene or EDPM; 45-55 Shore A durometer hardness; 3" long by 3/32" thick by 1/4" high; ASTM C864.

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3. Edge Blocks: Neoprene or EPDM, 60-70 Shore A durometer hardness; 4" long with minimum two per jamb located at top and bottom edges of glass; ASTM C864.
4. Glazing Gaskets: Exterior neoprene or EPDM; interior neoprene, EPDM, or vinyl; miter corner joints; ASTM C509 or C864.

K. Miscellaneous Materials:

1. Fasteners: Aluminum or non-magnetic stainless steel of type that will not cause electrolytic action or corrosion.
  - a. Do not use exposed fasteners except where unavoidable for assembly or for application of hardware.
  - b. Indicate exposed fasteners on shop drawings for specific approval; exposed fasteners shall be Phillips flat-head screws or Allen screws with finish matching item fastened.
  - c. Provide concealed fasteners for glazing stops.
2. Steel Reinforcement and Brackets: Manufacturer's standard with minimum 2 oz. hot-dip zinc coating, ASTM A123, applied after fabrication.
3. Bituminous Paint: Cold-applied mastic, SSPC Paint 12, compounded for 30 mil thickness per coat.
4. Anchoring Devices: Corrosion resistant type capable of supporting storefronts system and superimposed design loads; design to allow adjustments of system prior to being permanently fastened in place.

2.3 FABRICATION

- A. Fabricate aluminum folding storefront system to allow for clearances and shim spacing around perimeter of assemblies to enable installation; provide for thermal movement.
- B. Provide anchorage devices to securely and rigidly fit storefronts assemblies in place.
- C. Accurately fit together joints and corners; match components ensuring continuity of line and design; ensure joints and connections are flush, hairline and weatherproof.
- D. Provide structural reinforcing within framing members where required to maintain rigidity and as required to accommodate design loads.
- E. Complete cutting, fitting, forming, drilling, and grinding of metal work prior to cleaning, finishing, treatment, and application of coating.
- F. Finishing: After fabrication, prepare surfaces for finishing in accordance with recommendations of aluminum producer and finish manufacturer.
  1. Finish components of each assembly simultaneously to attain uniformity of color.

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- G. Weld by methods recommended by metal manufacturer and AWS; grind exposed welds smooth and restore mechanical finish; remove arises from cut edges and corners to a radius of approximately 1/64".
- H. Fit and assemble work at shop to greatest extent possible; disassemble only as required for shipment and erection.
- I. Reinforce work as necessary for performance requirements and for support.
  - 1. Provide internal reinforcing for hardware.
- J. Separate dissimilar materials with bituminous paint or preformed separators which will prevent corrosion.
- K. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts that permanently prevent "freeze-up" of joint.
- L. Fabricate and apply hardware, disassemble only as required for transportation and installation.
- M. Apply coat of bituminous paint on concealed aluminum surfaces to be in contact with cementitious and with dissimilar materials.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine surfaces of openings and verify dimensions; verify rough openings are level, plumb, and square and within storefront manufacturer recommended tolerances.
- B. Beginning of work constitutes acceptance of existing conditions.

**3.2 INSTALLATION**

- A. Install aluminum folding storefronts in accordance with manufacturer's recommendations and to meet design requirements indicated, for weathertight installation.
- B. Ensure folding storefronts are plumb, level, and free of warp or twist; maintain dimensional tolerances and alignment with adjacent work.
  - 1. Maximum Variation from Plane or Location: 1/8" in 12'-0", with maximum 1/2" variation in total length.
  - 2. Maximum Offset Between Members: 1/16".
- C. Use sufficient anchorage devices to secure and rigidly fasten system to building.
- D. Install hardware in accordance with manufacturer's recommendations, using proper templates.
  - 1. Install to operate freely and smoothly, with a maximum operating pressure of 5 pounds in accordance with ADA Standards.
  - 2. Coordinate installation of cylinders with Section 08 71 00.

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- E. Glass Installation: Comply with GANA Glazing Manual and glazing manufacturer instructions.
  - 1. Do not allow glass to touch metal surfaces.

**3.3 CLEANING**

- A. Clean aluminum surfaces promptly after installation of components, exercising care to avoid damage of finish.
- B. Remove nonpermanent labels immediately after sealant cures. Cure sealants for high early strength and durability.
- C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged during construction period, including natural causes, accidents, and vandalism.

**END OF SECTION**



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**SECTION 08 41 00**

**ENTRANCES AND STOREFRONTS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide aluminum-framed entrances and storefront systems with anchorage, glazing, and accessories as required for complete installation.
  - 1. Project to include wood doors set in exterior aluminum frames, refer to Section 08 14 00.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 90 00: Perimeter sealants and back-up materials.
  - 3. Section 08 14 00: Wood doors set in exterior aluminum frames.
  - 4. Section 08 35 50: Folding storefront.
  - 5. Section 08 71 00: Hardware for wood doors set in aluminum frames.
  - 6. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. American Architectural Metal Manufacturers (AAMA): Aluminum Store Front and Entrance Manual.
- B. Glass Association of North America (GANA): Glazing Manual.
- C. National Association of Architectural Metal Manuf. (NAAMM): Metal Finishes Manual.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Design/Build: Provide special engineering for entrances and storefronts to ensure they comply with applicable codes and Contract Documents.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature.
- B. Shop Drawings: Indicate pertinent dimensioning, general construction, component connections and locations, anchor methods and locations, hardware locations, and relevant details.
  - 1. Show deviations from Contract Documents.
  - 2. Coordinate storefront details with shop drawings for sheet metal flashing and adjacent exterior cladding.
  - 3. Include details for integration with adjacent construction.
- C. Samples: Furnish samples of metal finish, glass, and glazing gasket.
- D. Design/Build Certificates: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.

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- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to energy efficiency.
- B. Installer Qualifications: Manufacturer or firm with minimum five years' successful experience in the installation of systems similar to type and size required for Project and approved by manufacturer.

**1.6 WARRANTY**

- A. Extended Correction Period: Provide for correcting failures including wind damage and water penetration to interior surfaces, excessive deflections, and deterioration of finishes, weather-stripping and accessories.
  - 1. Period: Two years.
- B. Manufacturer's Warranty: Submit manufacturer's warranty including special manufacturer services as required for manufacturer's warranty.
  - 1. Period: 10 years.
  - 2. Manufacturer's warranty shall not detract from requirements of extended correction period nor from Owner's rights under implied and expressed warranties regardless of wording of manufacturer's warranty.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Basis of Design: Kawneer, an Arconic Company.

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- B. Arcadia, Inc.
- C. Oldcastle Building Envelope.

**2.2 MATERIALS**

- A. System Description: Provide aluminum-framed entrances and storefront systems, with anchorage, glazing, and accessories.
- B. Regulatory Requirements, General: Comply with requirements of applicable codes.
  - 1. Safety Glass Standard: Comply with applicable codes and CPSC 16 CFR 1201 and pass ANSI Z97.1.
- C. Regulatory Requirements, California Energy Code: Comply with California Energy Commission requirements regarding energy performance of entrances and storefronts.
  - 1. Manufacturer shall be responsible for providing information required by authorities necessary to verify conformance.
  - 2. Entire assembly, including glass and glazing, shall be certified by the National Fenestration Rating Council (NFRC) and shall bear NFRC Label indicating energy performance technical information.
- D. Regulatory Requirements, Accessibility: Comply with requirements of California Building Code and Americans with Disabilities Act (ADA) Standards to ensure access to persons with disabilities.
- E. Design Criteria: Comply with recommendations of AAMA Aluminum Store Front and Entrance Manual except where more stringent requirements are specified.
  - 1. Deflection: Maximum L/175, ASTM E330.
    - a. Safety Factor: Design for specified pressures with no glass breakage, no permanent damage to fasteners, and no permanent deformation of framing exceeding 0.2% of member clear span.
  - 2. Water Penetration: No uncontrolled water penetration, ASTM E331, with no water on exposed interior components; static pressure differential of 20% of inward wind load, with minimum 6-psf load.
  - 3. Air Leakage: Maximum 0.06 cfm/sf, ASTM E283, at differential static pressure of 6.24-psf at fixed glazing and not more than 0.3 cfm/sf at doors.
- F. Performance Criteria: Design assemblies capable of withstanding minimum uniform test pressures as required by applicable codes when tested in accordance with ASTM E330.
- G. Aluminum-Framed Entrance and Storefront Systems: Systems with profiles as indicated on Drawings; provide extruded aluminum security type glass stops of profile to suit frame design. Provide exterior aluminum frames for exterior wood doors.

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1. Clubhouse Building Basis of Design: Kawneer/Trifab 451T thermally broken, center glazed mullions, 2" wide by 4-1/2" deep, with glazing offset, 4-side captured.
  2. Public Restroom Basis of Design: Kawneer/Trifab 400 center glazed, mullions 1-3/4" wide by 4" deep.
  3. Aluminum Type: As recommended by manufacturer for application indicated, but not less than extruded aluminum, ASTM B221, 6061 or 6063 alloy and T5 or T6 temper.
  4. Finish, Color Anodized: Color anodized coating conforming with NAAMM Metal Finishes Manual, Architectural Class I, 0.7 mil or greater.
    - a. Color: Dark bronze anodized as approved by Architect.
    - b. Architect reserves right to reject units of color or texture variations which are visually objectionable, but only where variation exceeds range established by manufacturer prior to work.
- H. Operable Windows Installed In Storefront:
1. Basis of Design: Kawneer/GLASSVent; windows to have motorized operators tied to Building Management System.
  2. Insect Screens: Provide insect screens for operable windows; screens to be acceptable to Architect.
- I. Door Frames and Hardware: Barrier-free entry frames meeting code requirements for providing access for people with physical disabilities; by entrance manufacturer.
1. Metal and Finish: Match storefront system.
- J. Storefront Glass: Provide minimum thicknesses specified, but no less than thicknesses required based on window size and configuration and anticipated wind loading. Glass for wood doors is in Section 08 80 00 – Glazing.
1. Manufacturers below, or approved equal:
    - a. Vitro Architectural Glass (formerly PPG).
    - b. Oldcastle Glass.
    - c. Guardian Industries Corp.
    - d. Viracon.
  2. Glass Type GL-1, Insulated Glass: Preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space with minus 20-degree F dew point.
    - a. Performance: ASTM E2190 certified Insulating Glass Certification Council.
    - b. System: Manufacturer's standard dual seal system compatible with glazing system, and including spacers, desiccant, and standard corner construction.

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- c. Glass: Provide low iron glass comparable to Vitro/Starphire glass.
  - 1) Float Glass (Typical): Select glazing quality, clear float glass, ASTM C1036; nominal thickness 1/4".
  - 2) Tempered Glass (Where Indicated and Where Safety Glazing is Required): Select glazing quality, clear float glass, fully tempered, ASTM C1048, Kind FT; nominal thickness 1/4"; safety glass.
  - 3) Bird Friendly Glass: Provide bird friendly glass acid etch pattern on Number 1 surface comparable to Vitro/AviProtek E, Pattern 217.
  - 4) Low Emissivity Coating: Provide high performance low e coating comparable to Vitro/Solarban 72 on No. 2 surface.
- d. Total Unit Thickness: 1".
- 3. Glass Type GL-2, Single Light Translucent Glass.
  - a. Tempered Glass: Select glazing quality, float glass, fully tempered, ASTM C1048, Kind FT; nominal thickness 1/4"; safety glass.
  - b. Translucent Glass: As approved by Architect.
- K. Glazing Accessories: Of type recommended by manufacturer to suit security locations and applications for dry glazing installation.
  - 1. Setting Blocks: Neoprene or EPDM, 80-90 Shore A durometer hardness; 4" long by 3/8" thick by 1/4" high; ASTM C864.
  - 2. Spacer Shims: Neoprene or EDPM; 45-55 Shore A durometer hardness; 3" long by 3/32" thick by 1/4" high; ASTM C864.
  - 3. Edge Blocks: Neoprene or EPDM, 60-70 Shore A durometer hardness; 4" long with minimum two per jamb located at top and bottom edges of glass; ASTM C864.
  - 4. Glazing Gaskets: Exterior neoprene or EDPM; interior neoprene, EPDM or vinyl; miter corner joints; ASTM C509 or C864.
- L. Miscellaneous Materials:
  - 1. Fasteners: Aluminum or non-magnetic stainless steel of type which will not cause electrolytic action or corrosion.
    - a. Do not use exposed fasteners except where unavoidable for assembly or for application of hardware.
    - b. Indicate exposed fasteners on shop drawings for specific approval; exposed fasteners shall be Phillips flat-head screws or Allen screws with finish matching item fastened.
    - c. Provide concealed fasteners for glazing stops.

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2. Steel Reinforcement and Brackets: Manufacturer's standard with minimum 2 oz. hot-dip zinc coating, ASTM A123, applied after fabrication.
3. Bituminous Paint: Cold-applied mastic, SSPC Paint 12, compounded for 30 mil thickness per coat.
4. Flashing: Provide sub-sill flashing members; minimum 22 gage sheet aluminum of sizes and shapes indicated and as required to drain water to exterior; match adjacent aluminum member finish.
5. Anchoring Devices: Corrosion resistant type capable of supporting entrance system and superimposed design loads; design to allow adjustments of system prior to being permanently fastened in place.

**2.3 FABRICATION**

- A. Fabricate aluminum entrance and storefront system to allow for clearances and shim spacing around perimeter of assemblies to enable installation; provide for thermal movement.
- B. Provide anchorage devices to securely and rigidly fit entrance assemblies in place.
- C. Door Frames: Comply with California Building Code and Americans with Disabilities Act (ADA) Standards relating to access for persons with disabilities.
  1. Clear Opening Width: Minimum 32" clear opening width for each door.
- D. Accurately fit together joints and corners; match components ensuring continuity of line and design; ensure joints and connections are flush, hairline and weatherproof.
- E. Provide structural reinforcing within framing members where required to maintain rigidity and as required to accommodate design loads.
- F. Allow moisture entering joints and condensation occurring within frame construction to drain to exterior.
- G. Complete cutting, fitting, forming, drilling, and grinding of metal work prior to cleaning, finishing, treatment, and application of coating.
- H. Finishing: After fabrication, prepare surfaces for finishing in accordance with recommendations of aluminum producer and finish manufacturer.
  1. Finish components of each assembly simultaneously to attain uniformity of color.
- I. Weld by methods recommended by metal manufacturer and AWS; grind exposed welds smooth and restore mechanical finish; remove arises from cut edges and corners to a radius of approximately 1/64".
- J. Fit and assemble work at shop to greatest extent possible; disassemble only as required for shipment and erection.
- K. Reinforce work as necessary for performance requirements and for support.

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- L. Provide internal reinforcing for hardware.
- M. Separate dissimilar materials with bituminous paint or preformed separators which will prevent corrosion.
- N. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts which permanently prevent "freeze-up" of joint.
- O. Apply coat of bituminous paint on concealed aluminum surfaces to be in contact with cementitious and with dissimilar materials.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install aluminum framed storefront assemblies, including entrance frames, in accordance with manufacturer's recommendations and installation instructions and to meet design criteria and performance criteria indicated, for weather-tight installation.
  - 1. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- B. Ensure assemblies are plumb, level, and free of warp or twist; maintain dimensional tolerances and alignment with adjacent work.
  - 1. Maximum Variation from Plane or Location: 1/8" in 12'-0", with maximum 1/2" variation in total length.
  - 2. Maximum Offset Between Members: 1/16".
- C. Use sufficient anchorage devices to secure and rigidly fasten assemblies to building.
- D. Install hardware in accordance with manufacturer's recommendations, using proper templates. Coordinate with Section 08 71 00 – Door Hardware.
  - 1. Install doors to operate freely and smoothly, with a maximum operating pressure of 5 pounds in accordance with California Building Standards Code.
  - 2. Coordinate installation of cylinders with Section 08 71 00 – Door Hardware.
  - 3. Install sill members and thresholds in bed of compound, joint fillers, or gaskets to provide weathertight construction.
- E. Glass Installation: Comply with GANA Glazing Manual and glazing manufacturer instructions.
  - 1. Do not allow glass to touch metal surfaces.

**3.2 CLEANING**

- A. Clean aluminum surfaces promptly after installation of components, exercising care to avoid damage of finish.
- B. Mark glass after installation with crossed streamers attached to framing and held away from glass; do not apply markers to surface of glass.

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- C. Remove nonpermanent labels immediately after sealant cures and cure sealants for high early strength and durability.

**3.3 PROTECTION**

- A. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged during construction period, including natural causes, accidents, and vandalism.

**END OF SECTION**



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**SECTION 08 71 00**

**DOOR HARDWARE**

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**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
  - 1. Door Hardware, including electric hardware.
  - 2. Gate Hardware.
  - 3. Low-energy door operators plus sensors and actuators.
  - 4. Thresholds, gasketing and weather-stripping.
  - 5. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 06 40 00: Cabinet hardware.
  - 3. Section 08 11 10: Hollow Metal Door and Frames.
  - 4. Section 08 14 00: Wood Doors.
  - 5. Section 08 41 00: Entrances and Storefronts.
  - 6. Divisions 26 through 28: Electrical rough-in, wiring and connectors for electrified hardware.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. BHMA – Builders' Hardware Manufacturers Association
- B. CBC – 2021 California Building Code
- C. Americans with Disabilities Act (ADA) Standards.
- D. ANSI A115 and A115W Series: Door and Frame Preparation Standards.

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- E. ANSI A156 Series: Standards for various hardware items.
- F. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- G. DHI – Door and Hardware Institute
- H. NFPA - National Fire Protection Association.
  - 1. NFPA 80 - Fire Doors and Other Opening Protectives
  - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- I. UL - Underwriters Laboratories.
  - 1. UL 10C - Fire Tests of Door Assemblies
  - 2. UL 305 - Panic Hardware
- J. WHI - Warnock Hersey Incorporated
- K. SDI - Steel Door Institute

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate hardware installation doors including but not necessarily limited to following.
  - 1. Coordinate hardware installation with hollow metal doors and frames installation in Section 08 11 10.
  - 2. Coordinate hardware with installation with wood doors installation in Section 08 14 00 and Section 08 41 00.
- B. Pre-Installation Meeting: Convene pre-installation meeting prior to commencing work of this section. Include persons involved with installation of doors, frames, and hardware.

**1.05 SUBMITTALS**

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

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C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with;
  - a. Job Name, location, telephone number.
  - b. Architects name, location and telephone number.
  - c. Contractors name, location, telephone number and job number.
  - d. Suppliers name, location, telephone number and job number.
  - e. Hardware consultant's name, location and telephone number.
  
2. Job Index information included;
  - a. Numerical door number index including; door number, hardware heading number and page number.
  - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
  - c. Manufacturers' names and abbreviations for all materials.
  - d. Explanation of abbreviations, symbols, and codes used in the schedule.
  - e. Mounting locations for hardware.
  - f. Clarification statements or questions.
  - g. Catalog cuts and manufacturer's technical data and instructions.
  
3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h) 6AA	(i) ea 1 ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent

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information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

- D. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- F. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- G. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.
- H. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- I. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.06 QUALITY ASSURANCE**

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
  - 1. Responsible for detailing, scheduling and ordering of finish hardware.

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2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
  3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- F. Product packaging to be labelled in compliance with CA Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986.
- G. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

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- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.08 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
  - 1. Locksets: "L" Series (3) years – "ND" Ten (10) years.
  - 2. Electronic: One (1) year.
  - 3. Closers: Thirty (30) years -- except electronic closers shall be two (2) years.
  - 4. Exit devices: Three (3) years.
  - 5. All other hardware: Two (2) years.

1.09 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.10 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers		LCN Or Approved Equal
Protection Plates	Ives	Trimco, BBW, DCI

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Flush Bolts	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

**2.02 MATERIALS**

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
1. Hinges shall be sized in accordance with the following:
    - a. Height:
      - 1) Doors up to 42" wide: 4-1/2" inches.
      - 2) Doors 43" to 48" wide: 5 inches.
    - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
    - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
  2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.
- C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Sparta" design, fastened with through-bolts and threaded chassis hubs.
1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
    - a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
    - b. Offset lever pull – minimum 1,600 foot pounds without gaining access
    - c. Vertical lever impact – minimum 100 impacts without gaining access
  2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
  3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
  4. Cylinders: Refer to "KEYING" article, herein.

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5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
  6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
  7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
  8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
  9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
  10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
  11. Provide wired electrified options as scheduled in the hardware sets.
    - a. 12 through 24 volt DC operating capability, auto-detecting
    - b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
    - c. 0.230A (230mA) maximum current draw
    - d. 0.010A (10mA) holding current
    - e. Modular / "plug in" request to exit switch
  12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
- D. Schlage "L" Series as scheduled with "17" Style Lever and "A" Style Rose.
1. Locksets to comply with ANSI A156.13, Series 1000, Operational Grade 1 and Security Grade 1 with all standard trims. Locksets shall also comply with UL10C Positive Pressure requirements
  2. Lock case shall be manufactured with heavy 12 gauge steel with fully wrapped design. Lock cases with exposed edges are not acceptable. Lock case shall be multi-functional allowing transformation to a different function without opening lock case.
  3. Latchbolt shall have 3/4" throw and be non-handed, field reversible without opening the lock case. Solid latchbolts and / or plastic anti-friction devices are not acceptable.
  4. The deadbolt, when used, shall be 1" throw stainless steel with a 3/4" internal engagement when fully extended.
  5. All trim shall be through-bolted with the spring cages supporting the trim attached to the lock cases to prevent torquing.
  6. Levers to have independent rotation in both directions. Exterior lever assembly to be one-piece design attached by threaded bushing. Interior lever assembly shall be attached by screwless shank
  7. Thru-bolt lever assemblies through the door for positive interlock. Locks using a through the door spindle for attachment are not acceptable. Spindles shall be independent, designed to "break-away" at a maximum of 75psi torque.



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8. Hand of lock chassis to be changeable by simply moving one screw from one side to the case to the other and pulling and reversing the latchbolt.
  9. Cylinders to be secured by a cast stainless steel, dual retainer. Locks utilizing screws and / or stamped retainers are not acceptable.
- E. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of ¼" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.
- F. Exit devices: Von Duprin as scheduled.
1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
  2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
  3. Mechanism case shall have an average thickness of .140".
  4. Compression spring engineering.
  5. Non-handed basic device design with center case interchangeable with all functions.
  6. All devices shall have quiet return fluid dampeners.
  7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
  8. Device shall bear UL label for fire and or panic as may be required.
  9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
  10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
  11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
  12. Furnish glass bead kits for vision lites where required.
  13. All Exit Devices to be sex-bolted to the doors.
  14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    - a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.
- G. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A

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written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

H. Electro Mechanical Automatic Operators: LCN Senior Swing as schedule.

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19.
  - a. Opening: Powered by DC motor working through reduction gears.
  - b. Closing: Spring force.
  - c. Manual, hydraulic, or chain drive closers: Not permitted.
  - d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.

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- e. Cover: Aluminum.
- 2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
- 3. Provide drop plates, brackets, or adapters for arms as required to suit details.
- 4. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications. Provide LCN 8310-836T full length actuators.
- 5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets.
- 6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
  - 1) Provide caution signs as described in BHMA A156.19.
- I. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
  - 1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
  - 2. Provide dust proof strikes at openings using bottom bolts.
- J. Door Stops:
  - 1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
  - 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
  - 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- K. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

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- L. Thresholds: As Scheduled and per details.
  - 1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
  - 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
  - 3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
  - 4. Thresholds shall comply with CBC Section 11B-404.2.5.
  
- M. Seals: Provide silicone gasket at all rated and exterior doors.
  - 1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
  - 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
  - 3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.
  
- N. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
  
- O. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

- A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.
  
- B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
  
- C. Establish a new masterkey system for this project as directed by the keying schedule.

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- D. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI)
- E. Owner to verify permanent cores.
- F. Furnish construction keying for doors requiring locking during construction.
- G. Furnish all keys with visual key control.
  - 1. Stamp key "Do Not Duplicate".
  - 2. Stamp (BHMA) key symbol on key.
- H. Furnish all cylinders with visual key control.
  - 1. Stamp (BHMA) key symbol on side of cylinder (CKC).
- I. Furnish mechanical keys as follows:
  - 1. Furnish 2 cut change keys for each different change key code.
  - 2. Furnish 1 uncut key blank for each change key code.
  - 3. Furnish 6 cut masterkeys for each different masterkey set.
  - 4. Furnish 3 uncut key blanks for each masterkey set.
  - 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
  - 6. Furnish 1 cut control key cut to each SKD combination.
- J. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
  - 1. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
- K. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.
  - 1. Furnish CL100PB for use with non-I/C Schlage cylinders.
  - 2. Furnish CL77R for use with FSIC Schlage cylinders.
  - 3. Furnish CL721G for use with SFIC Schlage cylinders.

**2.04 FINISHES**

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

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- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

**2.05 FASTENERS**

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

**PART 3 - EXECUTION**

**3.01 INSPECTION**

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2018 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

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**3.02 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

**3.03 ADJUST AND CLEAN**

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of

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hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

**3.04 HARDWARE LOCATIONS**

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

**3.05 FIELD QUALITY CONTROL**

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

**3.06 SCHEDULE**

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

**Manufacturers Abbreviations (Mfr.)**

CRO	=	Crown Industries	Cane Bolts
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust
Proof			Strikes, Push Pull & Kick Plates, Door Stops
&			Silencers
LCN	=	LCN	Door Closers & Auto Operators
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
SEC	=	Securitron	Magnetic Locks, Timers & Exit Buttons
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping



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HARDWARE GROUP NO. 01

2	EA	CONT. HINGE	224XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-PA-9950WDC-EO-CON- SNB 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-PA-9950WDC-NL-OP- 110WD-CON-SNB 24 VDC	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURF. AUTO OPERATOR	9553 REG2 LESS TRACK MS AS REQ (120/240 VAC)	ANCL R	LCN
2	EA	ACTUATOR, TOUCH	8310-836T	630	LCN
1	EA	BATTERY BACK UP	SOLAK		LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	SEALS	BY AL FRAME MFR.		
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		
			CARD READER - WORK OF DIVISION 28		
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT(S) - WORK OF DIVISION 28		

HARDWARE GROUP NO. 02

1	EA	CONT. HINGE	224XY	628	IVE
1	EA	PANIC HARDWARE	PA-AX-99-L-17	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	SEALS (SOUND DAMPENING)	BY AL FRAME MFR.		
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

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HARDWARE GROUP NO. 03

1	EA	CONT. HINGE	224XY	628	IVE
1	EA	VANDL CLASSROOM LOCK	ND94TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG1	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	SEALS	BY AL FRAME MFR.		
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 04

1	EA	CONT. HINGE	224XY	628	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG1	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

ASSUMING AMPERAGE IS UNDER 800. IF AMPERAGE IS 800 OR ABOVE THIS DOOR  
WOULD BE REQUIRED TO HAVE PANIC HARDWARE

HARDWARE GROUP NO. 05

1	EA	CONT. HINGE	224XY	628	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG1	630	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

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HARDWARE GROUP NO. 06

1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	VANDL EL STOREROOM	ND96TDEL SPA CON 12V/24V DC	626	SCH
1	EA	MAGNETIC LOCK	MAGNALOCK M62		SEC
1	EA	DIGITAL TIMER	PRIME TIME DT-7		SEC
1	EA	EXIT BUTTON	EEB		SEC
1	EA	BOXED POWER SUPPLY	BPS 12/24-1		SEC
1	EA	SURFACE CLOSER	4040XP RW/PA (MOUNT PULL SIDE)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1		THRESHOLD	PER DETAIL		
1	EA	COAT AND HAT HOOK	582	ABLK	IVE
1	EA	PUSH BUTTON	623GIDEX 12/24 VDC OR BY OTHERS		SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC OR BY OTHERS CARD READER - WORK OF DIVISION 28 POWER SUPPLY - WORK OF DIVISION 28 DOOR CONTACT(S) - WORK OF DIVISION 28	BLK	SCE

HARDWARE GROUP NO. 07

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA (MOUNT PULL SIDE)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	RISER	R435/R437 (IF REQ)	719	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

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HARDWARE GROUP NO. 08

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	PA-AX-9950WDC-EO-LBL-SNB	626	VON
1	EA	PANIC HARDWARE	PA-AX-9950WDC-L-17-LBL-SNB	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
2	EA	RISER	R435/R437 (IF REQ)	719	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	SET	MEETING STILE	328AA-S	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
2	EA	DOOR BOTTOM	350AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 09

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	RISER	R435/R437 (IF REQ)	719	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	EA	DOOR BOTTOM	350AA	AA	ZER
1		THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 10

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ADA STOREROOM LOCK	ND81TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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HARDWARE GROUP NO. 11

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CONST LATCHING BOLT	FB61T	630	IVE
1	EA	ADA STOREROOM LOCK	ND81TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
2	EA	OH STOP	90S	630	GLY
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	MEETING STILE	44STST	STST	ZER
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD SPA	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	RISER	R435/R437 (IF REQ)	719	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	COAT AND HAT HOOK	582	ABLK	IVE

HARDWARE GROUP NO. 13

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/INDICATOR	L9056T 17A L583-363 L283-722	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA (MOUNT PULL SIDE)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	COAT AND HAT HOOK	582	ABLK	IVE

HARDWARE GROUP NO. 14

HARDWARE BY FOLDING  
DOOR MFR.

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HARDWARE GROUP NO. 15

2	EA	CANE BOLT	524P23		CRO
1	EA	FORK LATCH	BY NATION WIDE INDUSTRIES	BLK	DDT
			OR BY GATE FABRICATOR		
			BALANCE OF HARDWARE BY		
			GATE FABRICATOR		

HARDWARE GROUP NO. 16

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA (MOUNT PULL SIDE)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

**END OF SECTION**

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**SECTION 08 80 00**

**GLAZING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Provide miscellaneous glass and glazing not provided elsewhere including accessories as required for complete installation.
  - a. Provide glazing for exterior wood doors set in exterior aluminum frames.
  - b. Provide glazing for interior wood French doors.
  - c. Provide glazing for exterior aluminum frames.

**B. Related Sections:**

1. Section 01 81 13: Sustainable Design Requirements.
2. Section 08 35 50: Folding storefront glazing.
3. Section 08 41 00: Aluminum-framed entrances and storefronts glazing.
4. Section 10 28 00: Metal framed mirrors.

**1.2 REFERENCES**

- A. Glass Association of North America (GANA): Glazing Manual and Sealant Manual.**

**1.3 SUBMITTALS**

- A. Product Data:** Furnish for each type of glass and exposed glazing material.
- B. Samples:** Furnish samples of exposed glazing accessories.
- C. Sustainability Certification Points:** Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.**

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1.4 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

1.5 WARRANTY

- A. Extended Correction Period: Extend correction period to two years for following.
  - 1. Replacing insulated glass which exhibits signs of moisture on sealed glass surfaces.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- A. System Description: Section includes miscellaneous glass and glazing materials for items typically furnished without glazing and where glazing is not an integral part of the assembly.
- B. Regulatory Requirements:
  - 1. Safety Glass Standard: Comply with applicable codes, CPSC 16 CFR 1201, and pass ANSI Z97.1.
- C. Tempered Glass: Select glazing quality, clear float glass, fully tempered, ASTM C1048, Kind FT; nominal thickness 1/4"; safety glass.
  - 1. Manufacturers below, or approved equal:
    - a. Vitro Architectural Glass (formerly PPG).
    - b. Oldcastle Glazing.
    - c. Guardian Industries Corp.
  - 2. Locations: Provide at interior doors where required by applicable codes and federal requirements.
- D. Insulated Glass: Preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space with minus 20-degree F dew point.
  - 1. Manufacturers below, or approved equal:
    - a. Vitro Architectural Glass (formerly PPG).
    - b. Oldcastle Glazing.
    - c. Guardian Industries Corp.
    - d. Viracon.



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2. Performance: Certified to ASTM E2190 by Insulating Glass Certification Council.
  3. System: Manufacturer's standard dual seal system compatible with glazing system, and including spacers, desiccant, and standard corner construction.
  4. Glass: ASTM C1036, select glazing quality clear float glass; nominal 1/4" thick glass.
  5. Safety Glass: ASTM C1048, Kind FT, fully tempered select glazing quality clear float glass; nominal 1/4" thick glass; provide at doors and impact areas where safety glass is required by applicable codes and regulations.
  6. Bird Friendly Glass: Provide bird friendly glass acid etch pattern on Number 1 surface comparable to Vitro/AviProtek E, Pattern 217.
  7. Total Unit Thickness: 1".
  8. Locations: Provide at exterior wood doors unless otherwise indicated.
- E. Spacer Shims: Silicone compatible, 50 durometer hardness; 3" long by 3/32" thick by 1/4" high.
- F. Setting Blocks: 70-90 durometer hardness; 4" long by 3/8" thick by 1/4" high standard setting blocks.
- G. Glazing Sealant: ASTM C920, Type S, Grade NS, elastomeric one-component silicone glazing sealants as recommended by sealant manufacturer for application involved.
1. Manufacturers below, or approved equal:
    - a. Dow.
    - b. GE Momentive Performance Materials.
    - c. Pecora Corp.
  2. Structural and Butt Glazing: Provide high-modulus structural silicone glazing materials recommended by sealant manufacturer for applications where sealant bonds glass to metal system and where sealant bonds glass to glass.
  3. Color: As selected by Architect from manufacturer's full range of available colors.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Clean glazing channels and framing members to receive glass immediately before glazing; remove coatings not firmly bonded to substrate.
- B. Apply primer to joint surfaces where recommended by sealant manufacturer.

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**3.2 INSTALLATION**

- A. Comply with GANA Glazing Manual and Sealant Manual and glazing manufacturer recommendations and installation instructions.
  - 1. Do not allow glass to touch metal surfaces.
  - 2. Comply with applicable code requirements and NFPA 80 for glass in fire rated openings.
- B. Place setting blocks at quarter points in thin course of sealant.
- C. Install removable stops with glass centered in space with spacer shims at 2'-0" intervals on both sides of glass, 1/4" below sightline.
- D. Sealant Glazing: Fill gap between glass and stops with sealant to depth equal to bite of frame on glass but not more than 3/8" below sightline.
  - 1. Apply sealant to uniform and level line, flush with sightline; tool or wipe sealant surface for smooth appearance; at exterior locations tool sealant so water is carried away from glass.

**3.3 CLEANING**

- A. At areas subject to potential impact mark glass after installation by crossed streamers attached to framing and held away from glass; do not apply markers to surface of glass.
- B. Remove nonpermanent labels immediately after sealant cures and cure sealants for high early strength and durability.
- C. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged during construction period, including natural causes, accidents, and vandalism.

**END OF SECTION**

**SECTION 08 91 00**

**LOUVERS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide formed metal louvers and frames, with screens, attachment hardware, and accessories as required for complete finished installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.

**1.2 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature for each type of louver.
- B. Shop Drawings: Indicate profile of frame, details, relation to adjacent construction, flashing, blade configuration, duct work connection, screens, and percentage of free air opening.
- C. Samples: Furnish samples of metal finish.
- D. Certificates: Where performance requirements are included, provide AMCA Certified Rating Seal indicating louvers comply with requirements.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

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1.4 SITE CONDITIONS

- A. Take site dimensions affecting louvers prior to fabrication.
- B. Ensure openings are properly prepared and flashings are correctly located to divert moisture to exterior.
- C. Protect adjacent surfaces, finishes and materials from damage during installation of louvers.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

Manufacturers below, or approved equal:

- A. The AiroLite Corporation.
- B. Construction Specialties, Inc. (CSI).
- C. Airline Products Co.
- D. Nystrom Building Products.
- E. Ruskin.

2.2 MATERIALS

- A. System Description: Provide formed metal louvers and frames, with screens, attachment hardware, and accessories.
- B. Performance Criteria: Where indicated, comply with specific performance requirements; unit performance ratings determined in compliance with Air Movement and Control Association (AMCA) Standard 500.
  - 1. Free Area: Minimum 45% based on 48" by 48" louver.
  - 2. Static Pressure Loss: Maximum 0.15" of water gage at airflow of 1000 fpm free air velocity.
  - 3. Water Penetration: Maximum 0.05 oz/sf of free area at intake airflow of 1000 fpm free area velocity.
- C. Aluminum Sheet: ASTM B209, manufacturer's standard alloy; minimum 0.08" thick.
- D. Steel Sheet: Minimum 16 gage steel, ASTM A924 and A653 with G90 galvanized coating, mill phosphatized.

2.1 FABRICATION

- A. Louvers: Manufacturer's standard fabrication for types specified and configurations indicated on Drawings.

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1. Type: Sheet metal louvers formed of shapes as indicated; Contractor option aluminum sheet or galvanized steel sheet unless otherwise indicated.
- B. Bird Screen for Exterior Louvers: Minimum 0.063" diameter wire, 1/2" interwoven square mesh.
  1. Wire: Stainless-steel.
  2. Frame: Match louver.
- C. Fabricate louvers to maximum extent possible and disassemble as necessary for shipping and handling limitations; clearly mark units for reassembly and installation.
  1. Fabricate frames, including integral sills, to suit adjacent construction with tolerances for installation.
  2. Fabricate sill extension, flashings, wall anchors, structural supplementary sub-framing, and accessories as required for complete system; use same materials as provided for louvers.
- D. Join frame members and louver blades by welding; maintain equal blade spacing, including separation between blades and frame head and sill; maintain uniform appearance.
- E. Shop Primed Louvers: Manufacturer's standard thermosetting prime coating compatible with paints specified in Section 09 90 00 - Painting and Coating.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install louvers in accordance with manufacturer recommendations and installation instruction, properly aligned and level.
- B. Secure louver rigid with concealed fasteners of non-corrosive metals to suit materials being encountered and to resist anticipated loads.
- C. Coordinate installation method with application of adjacent backing and structural elements, and mechanical work.
- D. Set and tie into flashings to ensure diversion of moisture to exterior.
- E. Hinge screens for access.

**END OF SECTION**

**SECTION 09 21 00**

**GYPSUM BOARD ASSEMBLIES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide gypsum board systems including gypsum board, suspension system for gypsum board systems, joint treatment, acoustical accessories, and general accessories for complete installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Division 06: Wood stud framing.
  - 3. Section 07 21 00: Building thermal insulation.
  - 4. Section 09 30 00: Cementitious backer unit tile substrates.
  - 5. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. ASTM C754: Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board.
- B. ASTM C840: Application and Finishing of Gypsum Board.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination, Openings: Obtain dimensions and locations from other trades and provide openings and enclosures for accessories, specialties, equipment, and ductwork.
- B. Delegated Design Requirements: Provide special engineering to ensure suspended system compliance with applicable codes and Contract Documents including seismic and structural design engineering.

**1.4 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature for framing, insulation, gypsum board, and acoustical accessories.
- B. Shop Drawings: Indicate ceiling layout, component details, framing of openings, dimensioning, junctions with other finishes, inter-relation of mechanical and electrical items, inserts and hanger spacing, fastening details, and seismic bracing.
- C. Manufacturer Certification: Provide certification by manufacturer indicating compliance with Contract Documents and applicable codes.
- D. Delegated Design Engineering Certificates and Calculations: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.

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1. Calculations: Where requested, submit calculations directly to enforcing agency.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives, sealants, and caulks.
- B. Level 4 Finish Mock-Up: Provide Level 4 finish mock-up not less than 100 square feet in location acceptable to Architect. Approved mock-up may be incorporated into Project.

**1.6 SITE CONDITIONS**

- A. Do not begin installation of interior gypsum board until space is enclosed, space is not exposed to other sources of water, and space is free of standing water.
- B. Maintain areas to receive gypsum board at minimum 50-degree F for 48 hours prior to application and continuously after application until drying of joint compound is complete; comply with ASTM C840.
- C. Immediately remove from site gypsum board for interior use exposed to water, including gypsum board with water stains, with signs of mold, and gypsum board with mildew.

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**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. National Gypsum Co.
- B. Georgia-Pacific Corp.
- C. United States Gypsum Co., USG Corp.

**2.2 MATERIALS**

- A. System Description: Provide gypsum board assemblies including gypsum board, light gage metal framing, suspension system for gypsum board systems, joint treatment, acoustical accessories, and general accessories.
  - 1. Systems Responsibility: Provide products manufactured by or recommended by manufacturer of gypsum board to maintain single-source responsibility for system.
- B. Performance Requirements: Perform gypsum board systems work in accordance with recommendations of ASTM C754 and ASTM C840 unless otherwise specified.
  - 1. Loads: Comply with California Building Code requirements for design of metal framing for gypsum board systems, maximum allowed deflection L/240.
- C. Regulatory Requirements:
  - 1. Fire-Rated Assemblies: Provide systems listed in applicable code or by Underwriter's Laboratory, Gypsum Association (GA) File No's in GA-600 Fire Resistance Design Manual or other listing approved by applicable authorities.
  - 2. Seismic Requirements: Comply with code requirements for seismic bracing.
- D. Framing: Comply with ASTM C754, 20-gage and lighter unless otherwise indicated; provide gages as recommended by manufacturer for spans and loads indicated and as required by applicable codes.
  - 1. Hangers: ASTM A641, Class 1 wire not less than sizes in Table No. 5 of ASTM C754 and as required by applicable codes; hanger rods, flat hangers, and angle-type hangers as required.
  - 2. Suspension System: ASTM C635, suspension system composed of main beams and cross furring members interlocking to form supporting network; recommended by gypsum board system manufacturer.
  - 3. Fasteners and Anchorages: As recommended by gypsum board system manufacturer.
- E. Gypsum Board: Comply with ASTM C840; maximum permissible lengths; ends square cut, tapered edges on boards to be finished.
  - 1. Typical: ASTM C1396, Type X, fire rated gypsum board, unless otherwise indicated.



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2. Mold Resistant Gypsum Board: Provide at high humidity areas not covered with tile including but not limited to spaces not fully enclosed.
    - a. Manufacturers below, or approved equal:
      - 1) USG/Sheetrock Mold Tough Firecode Core.
      - 2) Georgia Pacific/ToughRock Mold-Guard Fireguard X.
      - 3) National Gypsum/Gold Bond XP Fire-Shield Gypsum Board.
  3. Cementitious Backer Units for Fiberglass Wall Panels: ANSI A118.9 aggregated Portland cement with woven glass-fiber mesh on both faces; approximately 1/2" thick; UL rated for fire rated assemblies.
    - a. Manufacturers below, or approved equal:
      - 1) National Gypsum Co./PermaBase Cement Board.
      - 2) USG Industries, Durabond Division/Durock.
      - 3) Custom Building Products/Wonderboard.
      - 4) James Hardie Building Products/Hardibacker.
    - b. Contractor Option Coated Glass Mat Backer Units: Georgia Pacific/DenShield, UL fire rated as required to maintain integrity of fire rated assemblies.
  4. Tile Substrates: Cementitious backer units specified in Section 09 30 00 - Tiling.
  5. Glass Mat Sheathing: Silicone treated glass mat gypsum sheathing, ASTM C1177, Type X, 5/8" thick unless otherwise indicated.
    - a. Manufacturers below, or approved equal:
      - 1) Georgia Pacific/DensGlass Gold Fireguard Type X.
      - 2) USG/Securock Glass Mat Sheathing Firecode X.
      - 3) National Gypsum/Gold Bond Brand eXP Fire-Shield Sheathing.
- F. Gypsum Board Accessories: Comply with ASTM C840.
1. Provide protective coated steel corner beads and edge trim; type designed to be concealed in finished construction by tape and joint compound.
  2. Corner Beads: Manufacturer's standard metal beads.
  3. Edge Trim: "J", "L", "LK", or "LC" casing beads.
  4. Reinforcing Tape, Joint Compound, Adhesive, Water, Fasteners: Types recommended by system manufacturer and conforming to ASTM C475.
    - a. Typical Joint Compound: Chemical hardening type for bedding and filling, ready-mixed or powder vinyl type for topping.
  5. Control Joints: Back-to-back casing beads.
    - a. Back control joints with 4 mil thick polyethylene air seal.

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- G. Acoustical Accessories: Provide as indicated and as required to achieve acoustical ratings indicated.
1. Acoustical Insulation: Preformed mineral fiber, ASTM C665, Type I; friction fit type without integral vapor barrier; as required to meet STC ratings indicated, or of thickness indicated.
  2. Acoustical Sealant: ASTM C919, type recommended for use in conjunction with gypsum board. Paintable, non-shrinking and non-cracking where exposed, nondrying, nonskinning, nonstaining, and nonbleeding where concealed.
    - a. Acoustical Sealant Manufacturers below, or approved equal::
      - 1) USG/Sheetrock Acoustical Sealant.
      - 2) Tremco/Acoustical Sealant.
      - 3) Pecora/AC-20.
  3. Electrical Box Pads: Provide at outlet, switch, and telephone boxes in walls with acoustical insulation.
    - a. Electrical Box Pad Manufacturers below, or approved equal:
      - 1) Harry A. Lowry & Associates (800.772.2521)/Lowry's Electrical Box Pads.
      - 2) Tremco Sheet Caulking (650.572.1656).
      - 3) Hevi-Duty Nelson (800.331.7325)/Putty Pads.
      - 4) Specified Technologies, Inc. (800.992.1180)/Putty Pads.
      - 5) Hilti, Corp./Hilti Box Pads.
- H. Fire Rated Assembly Accessories: Provide materials and accessories as required to comply with fire rating requirements of UL, GA or other listing approved by applicable authorities.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Ceiling Framing Installation: Erect in accordance with ASTM C754 and manufacturer's recommendations.
1. Coordinate location of hangers with other work; provide trapeze supports and steel bracing as required to support ceiling.
  2. Install ceiling furring independent of walls, columns, and above-ceiling work.
  3. Space main carrying channels at maximum 48" on center, not more than 6" from perimeter walls.
    - a. Lap splices minimum 12" and secure together 2" from each end of splice.
  4. Place furring channels perpendicular to carrying channels at maximum 24" on center and not more than 2" from perimeter walls.
  5. Lap splices minimum 8" and secure together 2" from each end of splice.

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6. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing; extend bracing minimum 24" past each end of openings.
  7. Laterally brace entire suspension system.
- B. Gypsum Board Installation: Install in accordance with ASTM C840 and manufacturer's recommendations.
1. Use screws when fastening gypsum board to furring and to framing.
  2. Erect gypsum board with ends and edges occurring over firm bearing.
    - a. Ensure joints of second layer do not occur over joints of first layer in double layer applications.
  3. For fire rated systems comply with requirements for fire ratings.
  4. Place control joints to be consistent with lines of building spaces and as directed by Architect.
    - a. Provide where system abuts structural elements.
    - b. Provide at dissimilar materials.
    - c. Lengths exceeding 30'-0" in partitions.
    - d. Ceiling areas exceeding 50'-0" or 2500 square feet.
    - e. Wings of "L", "U" and "T" shaped ceilings.
  5. Place corner beads at external corners; use longest practical lengths.
  6. Place edge trim where gypsum board abuts dissimilar materials.
  7. Tape, fill, and sand exposed joints, edges, corners, and openings to produce surface ready to receive finishes and feather coats onto adjoining surfaces.
  8. Finishing: Comply with Gypsum Association (GA) "Levels of Gypsum Board Finish".
    - a. GA Level 4 (Typical): Provide three-coat finishing and sanding is required for surfaces indicated to be painted; provide flush, smooth joints and surfaces ready for applied paint finishes.
  9. Remove and replace defective work.
- C. Acoustical Accessories Installation:
1. Place acoustical insulation tight within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
  2. Place acoustical sealant within partitions in accordance with manufacturer's recommendations; install acoustical sealant at gypsum board perimeter at:
    - a. Metal Framing: One or two beads.
    - b. Base layer and face layer.

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- c. Penetrations of partitions.
- 3. Tolerance: Maximum 1/4" space between gypsum board at floor, ceiling, and penetrations and sealed with acoustical sealant.
- 4. Install electrical box pads with pads molded and pressed on back and all sides of box, closing openings, in accordance with manufacturer's instructions, for complete acoustical barrier.

**END OF SECTION**

**SECTION 09 25 00**

**ACOUSTICAL PLASTER**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Provide spray-on acoustical plaster with accessories as required for complete finished installation.
- B. Related sections:
  - 1. Appendix A: Finish and Materials Schedule.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product information for each lathing material and accessory, and for acoustical plaster materials.
- B. Samples: Construct sample panels with finished surface, using materials and methods specified.

1.3 QUALITY ASSURANCE

- A. Qualification of Applicator: Firm acceptable to manufacturer of acoustical plaster materials, with minimum five years successful experience on projects of similar scope.
- B. Mock-Up: Provide not less than 100 sf mock-up of acoustical plaster. Approved mock-up may be incorporated into Project.

1.4 PROJECT CONDITIONS

- A. Provide sufficient heat and ventilation in areas where acoustical plaster work is being performed, so as to allow acoustical plaster to properly cure.
- B. Take precautionary measures necessary to ensure excessive temperature changes do not occur.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

- A. Basis of Design: Pyrok, Inc.
- B. Approved equal

2.2 MATERIALS

- A. System Description: Provide sprayed-on acoustical plaster with accessories.

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- B. Regulatory Requirements, Fire Performance: Provide materials listed by UL or independent testing and inspection agency acceptable to applicable authorities.
  - 1. Fire Resistance Ratings: Comply with required ratings based on tests in accordance with ASTM E119.
  - 2. Surface Burning Characteristics: Maximum 25 flame-spread and 450 smoke developed when tested in accordance with ASTM E84.
- C. Acoustical Plaster:
  - 1. Basis of Design: Pyrok/Acoustement 40.
  - 2. Noise Reduction Coefficient (NRC): 0.65 or better.
- D. Water: Clean, fresh, and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances.
- E. Accessories: Provide bonding materials and accessories as recommended by acoustical plaster manufacturer for complete finished acoustical plaster installation.

### 2.3 PLASTER MIXES

- A. Provide plaster mixes in accordance with manufacturer recommendations for application indicated, as appropriate to substrate indicated, and to match approved samples.
- B. Mix acoustical plaster finish in accordance with manufacturer recommendations.
- C. Mix only as much acoustical plaster as can be used in one hour.
- D. Mix materials dry, to uniform color and consistency, before adding water.
- E. Protect mixes from dirt, dust, and evaporation.

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Comply with manufacturer's recommendations and installation instructions for preparation of surfaces to receive acoustical plaster.
- B. Protect adjacent surfaces and equipment from damage by overspray, fallout, and dusting; mask adjacent work as required.
  - 1. Take special care to protect other surfaces which are to remain permanently exposed from overspray.
- C. Provide temporary enclosure to prevent spray from contaminating air.
- D. Close off and seal duct work in areas where acoustical plaster is being applied.
- E. Clean substrate of dirt, grease, oil, loose material, paints, primers, and other matter which affects bond of acoustical plaster.

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- F. Remove incompatible materials which affect bond by scraping, brushing, scrubbing or sand blasting.
- G. Verify bond requirements and compatibility of surfaces to receive acoustical plaster before application of sprayed-on acoustical plaster.
- H. Ensure sleeves and attachments required to penetrate acoustical plaster are in place prior to application of acoustical plaster.
- I. Prior to application, ensure mechanical and electrical services on and behind surfaces to receive acoustical plaster have been tested and approved.

**3.2 INSTALLATION**

- A. Acoustical Plaster: Spray-apply acoustical plaster in accordance with manufacturer recommendations and application instructions.
  - 1. Finish: Match approved samples and mock-up.

**3.3 CLEANING**

- A. Promptly remove acoustical plaster from surfaces not indicated to be plastered.
- B. Repair surfaces stained, marred, or otherwise damaged during acoustical plastering.

**END OF SECTION**

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**SECTION 09 30 00**

**TILING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide tile installations with accessories, as required for complete installation.
  - 1. Provide waterproofing membrane integral with tile setting beds.
  - 2. Provide cementitious backer unit tile substrate.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 09 21 00: Cementitious backer units for fiberglass wall panels.
  - 3. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. ANSI A108.5: Installation of Tile with Latex-Portland Cement Mortar.
- B. ANSI A108.10: Installation of Grout in Tilework.
- C. ANSI A108.11: Interior Installation of Cementitious Backer Units.
- D. Tile Council of North America (TCNA): Handbook for Ceramic Tile Installation.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature for each type of material for Project.
- B. Samples: Furnish each type of tile clearly indicating pattern, coloration, and joints.
  - 1. Color Charts: Submit actual tile sections showing full range of colors, textures, and patterns available for each type of tile.
  - 2. Prepare two 12" square sample panels of each selected type of tile and grout.
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.



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- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives, sealants, and caulks.

**1.5 SITE CONDITIONS**

- A. Provide heat and ventilation in areas where ceramic tile work is being performed, to allow tile to properly set.
- B. Take precautionary measures necessary to ensure excessive temperature changes do not occur.

**1.6 WARRANTY**

- A. Extended Correction Period: Provide for correcting failure of system to resist water penetration except where failure is result of structural failure of building. Repair system and pay for or replace damaged materials and surfaces.
  - 1. Hairline cracking due to temperature or shrinkage is not structural failure.
  - 2. Period: Two years.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide tile installations with tile, grout, setting materials, and accessories as indicated.
- B. Regulatory Requirements, Slip-Resistance: Hard surface finishes to comply with requirements of authorities having jurisdiction for slip-resistant hard surfaces, including general code requirements and access for persons with disabilities.
- C. Tile: Types as indicated which could include ceramic, ceramic mosaic, quarry, paver, porcelain, stone, and glass type tiles.
  - 1. Manufacturers below, or approved equal:
    - a. Dal-Tile Corp.
    - b. Crossville Tile.

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- c. Summitville Tiles, Inc.
    - d. Manufacturers listed on Finish Schedule.
  - 2. Color, Style, and Pattern: As indicated on Finish Schedule, as selected by Architect from manufacturer's full range of types of tiles indicated where not otherwise indicated.
    - a. Match Architect approved samples.
  - 3. Base and Trim: Provide matching trim pieces, coordinated with sizes and coursing of adjoining flat tile as directed by Architect; types as indicated, as selected by Architect where not indicated.
- D. Latex Thin Set: Thinset bond coat, consisting of latex-cementitious mortar conforming to ANSI A118.4.
- 1. Manufacturers below, or approved equal:
    - a. Laticrete International Inc.
    - b. Bostik Construction Products/Hydroment.
    - c. Custom Building Products.
    - d. Mapei Corp.
    - e. Merkrete.
- E. Latex-Cement Grout: ANSI A118.7, latex-cementitious type, uniform in color, resistant to shrinkage.
- 1. Manufacturers below, or approved equal:
    - a. Laticrete International Inc.
    - b. Bostik Construction Products/Hydroment.
    - c. Custom Building Products.
    - d. Mapei Corp.
    - e. Merkrete.
  - 2. Color: Match tile unless otherwise indicated.
- F. Waterproofing and Crack Isolation Membrane: Manufacturer's standard liquid rubber polymer designed specifically for application under tile in non-immersed applications.
- 1. Manufacturers below, or approved equal:
    - a. Laticrete International Inc./9235 Waterproof Membrane.
    - b. Bostik Construction Products/Hydroment Ultra-Set.
    - c. Custom Building Products/RedGard Membrane.
    - d. Merkrete/Hydro-Guard SP-1.
    - e. The Nobel Company/NobelSeal TS.

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- G. Cementitious Backer Units: ANSI A118.9 aggregated Portland cement with woven glass-fiber mesh on both faces; approximately 1/2" thick; UL fire rated as required to maintain integrity of fire rated assemblies.
  - 1. Manufacturers below, or approved equal:
    - a. USG Industries, Durabond Division/Durock.
    - b. National Gypsum Co./PermaBase Cement Board.
    - c. Custom Building Products/Wonderboard.
  - 2. Contractor Option Coated Glass Mat Backer Units: Georgia Pacific/DenShield, UL fire rated as required to maintain integrity of fire rated assemblies.
- H. Cleaning and Sealing Materials: As recommended by tile and grout manufacturers but not less than following.
  - 1. Manufacturers below, or approved equal:
    - a. Laticrete International Inc./Stonetech.
    - b. Bostik Construction Products/Hydroment CeramaSeal.
- I. Accessories: Provide as indicated and as required for complete tile installation for applications indicated.

## 2.1 MIXES

- A. Mix and proportion cementitious materials for site-made leveling coats, setting beds and grout as recommended by the TCNA Handbook for Ceramic Tile Installation.
- B. Mix and proportion pre-mixed setting beds and grout materials in accordance with manufacturer's recommendations.

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Prior to installing tile, ensure surfaces are level; comply with TCNA and tile manufacturer recommendations but not greater than following.
  - 1. Thin Set Tile Tolerance: Maximum surface variation of 1/8" in 10'-0".
- B. Ensure surfaces are clean and well cured.
- C. Do not commence work until surface conditions are within tolerances required for proper installation; apply latex leveling material where necessary to meet required tolerances.
- D. Waterproof and Crack Isolation Membrane: Install waterproof membrane at tile areas located above grade, in accordance with manufacturer's recommendations; extend membrane minimum 6" up walls.
  - 1. Comply with waterproof membrane manufacturer recommendations for installation of tile over waterproof membrane.

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- E. Backer Units: Install units in accordance with ANSI A108.11, manufacturer's recommendations, and as required to provide fire ratings indicated on Drawings.

**3.2 INSTALLATION**

- A. Install tile in accordance with manufacturer recommendations and installation instructions, referenced ANSI Standards, and TCNA recommendations for type of substrate and indicated setting method.
  - 1. Complexity of TCNA variations in types of tile installation systems and potential for changes to surrounding conditions during design and construction makes exact listing of potential conditions improbable.
  - 2. Contractor, installers, and manufacturer representatives shall inform Architect where actual conditions are not covered and where providing similar materials and systems do not comply with TCNA or manufacturer recommendations.
    - a. Where specified or similar materials and systems do not comply with TCNA or manufacturer recommendations submit proposed substitutions along with statement substitutions are of comparable quality to specified materials.
- B. Following systems shall form the basis of tile installation systems required for Project. Where Project conditions vary from TCNA and manufacturer recommendations, notify Architect immediately. Where different use similar materials and systems as appropriate.
  - 1. Latex-Cement Thin Set Floors over Waterproof and Crack Isolation Membrane: TCNA F122.
  - 2. Latex-Cement Thin Set Wall Tile over Cementitious Backer Units: TCNA W244.
  - 3. Latex-Cement Thin Set Wall Tile over Coated Glass Mat Backer Units: TCNA W245.
- C. Place tile in accordance with patterns indicated on Drawings or as directed by Architect; carefully plan tile layouts, ensure pattern is uninterrupted from one surface to the next and through doorways.
  - 1. Apply latex thin set to back of tile where necessary to ensure 100% bond between bond coat and substrate; replace tiles which break due to voids between tile and substrate.
- D. Neatly cut tile around fixtures and drains; accurately form corners, base, intersections and returns.
  - 1. Base, Coves: Flush cove type with base grout joint on wall, cove tile on floor, unless otherwise indicated.
  - 2. Corners and Edges: Bullnose tile unless otherwise indicated.
- E. Locate expansion joints, control joints, contraction joints, and isolation joints where indicated; where not indicated, provide as recommended by TCNA Handbook and as approved by Architect.
  - 1. Install special trim pieces as indicated on Drawings and in accordance with manufacturer recommendations and installation instructions, true to lines and levels indicated and in correct relationship with tile and adjacent materials.

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- F. Ensure tile joints are uniform in width, subject to normal variance in tolerance allowed in tile size; ensure joints are watertight, without voids, cracks, excess mortar, or grout.
- G. Sound tile after setting, remove and replace hollow sounding units.
- H. Allow tile to set for a minimum 48 hours prior to grouting.
- I. Grout tile to comply with recommendations of TCNA and as specified.
- J. Leave completed installation free of broken, damaged, and faulty tile.

**3.2 CLEANING AND SEALING**

- A. Clean tile surfaces free of foreign matter upon completion of grouting.
- B. Seal tile and grout surfaces when recommended by manufacturer for materials and applications involved; comply with manufacturer's recommendations.

**END OF SECTION**

**SECTION 09 54 20**

**MANUFACTURED WOOD CEILINGS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide manufactured shop finished wood ceiling systems, both suspended lay-in system and direct applied system, including metal suspension system and accessories as required for complete finished installation.
  - 1. Provide manufactured wood system for exterior soffits where indicated.
- B. Related Work:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 07 46 20: Wood siding and custom wood board soffits.
  - 3. Section 09 96 20: Graffiti Resistant Coating.
  - 4. Divisions 21 through 28: Facilities services for ceiling penetrations.
  - 5. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. ASTM C635: Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636: Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- C. ASTM E580: Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate installation of acoustical ceiling systems with items installed above ceilings to ensure work above ceilings is complete, ceiling space allows for concealed items while allowing required ceiling heights, and building is enclosed.
- B. Delegated Design Requirements: Provide special engineering to ensure suspended system compliance with applicable codes and Contract Documents including seismic and structural design engineering.

**1.4 SUBMITTALS**

- A. Product Data: Furnish manufacturers literature.
- B. Shop Drawings: Indicate ceiling and soffit layout, component details, framing of openings, dimensioning, junctions with other finishes, inter-relation of mechanical and electrical items, inserts and hanger spacing, fastening details, and seismic bracing.
- C. Samples: Furnish samples of finished wood for ceiling and exposed components.
- D. Manufacturer Certification: Provide certification by manufacturer indicating compliance with Contract Documents and applicable codes.

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- E. Delegated Design Engineering Certificates and Calculations: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.
  - 1. Calculations: Where requested, submit calculations directly to enforcing agency.
- F. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- G. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Sustainability Requirements: Comply with CALGreen requirements including those relative to finish material pollution control for composite wood products formaldehyde limitations, paints and coatings.
- C. Installer Qualifications: Firm with minimum three years' successful experience in projects of similar type and scope; and acceptable to manufacturer of ceiling system.

**1.6 PROJECT CONDITIONS**

- A. Do not install ceiling until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead mechanical work is completed, tested, and approved.
- B. Allow wet work to dry prior to commencement of installation.
- C. Maintain uniform temperatures of minimum 60 degrees F and humidity of 20 percent to 40 percent prior to, during and after installation.

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**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Basis of Design: 9Wood.
- B. Rulon International.
- C. Armstrong World Industries.

**2.2 MATERIALS**

- A. Section Includes: Provide shop finished wood lay-in ceiling and soffit system including metal suspension system and accessories.
- B. Regulatory Requirements, Seismic Design Requirements: Comply with California Building Code requirements for seismic bracing of ceiling suspension system, and with ASTM E580.
  - 1. Ceiling Struts: Provide struts as detailed on Drawings and as required by code, placed maximum 12'-0" on center in both directions and within 6'-0" of each wall.
  - 2. Slack Wires: Provide safety slack wires, two per fluorescent fixture on diagonally opposite corners and a single wire for each recessed down light.
- C. Regulatory Requirements; Fire Performance Characteristics: Provide products listed by Underwriters Laboratories (UL) or other independent testing laboratory acceptable to authorities having jurisdiction.
  - 1. ASTM E84: Provide products meeting code requirements for maximum 25 flame spread and maximum 450 smoke developed.
- D. Wood Ceiling Systems:
  - 1. Interior Wood Ceiling System Basis of Design: 9Wood/Series 2000 Linear Wood, Style 2100 Panelized Linear Wood, Western Hemlock.
  - 2. Exterior Wood Soffit System Basis of Design: 9Wood/Series 2000 Linear Wood, Style 2100 Panelized Linear Wood, Western Hemlock.
  - 3. Wood: As indicated, match Architect approved samples.
  - 4. Edges: As indicated on Drawings, as selected by Architect from manufacturer's full range of edge conditions where not otherwise indicated.
  - 5. Finish: Manufacturer's premium quality clear finish producing a dull rubbed effect, as applicable for interior and exterior, as approved by Architect.
- E. Suspension System: Comply with ASTM C635, as applicable to type of suspension system.
  - 1. Coordinate with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, and partition systems.



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2. Maximum allowable deflection: L/360.
  3. Attachment Devices: Size for 5 times design load indicated in ASTM C635, Table 1, Direct Hung.
  4. Hanger Wires: Galvanized carbon steel, ASTM A641, soft temper, prestretched, yield-stress load of at least 3 times design load, but not less than 12-gage.
  5. Channels, Straps, Tubes and Angles: Provide galvanized steel as required to meet state and local requirements for seismic design loads.
  6. Wood Suspension Track and Clips: Manufacturer's standard system for supporting wood ceiling.
  7. Structural Class: Heavy-duty system unless otherwise recommended by ceiling manufacturer.
  8. Edge Molding: As indicated, where not otherwise indicated provide concealed channel molding for edges and penetrations of ceiling.
- F. Acoustical Insulation Pads (Interior): MBI ([www.mbiproducts.com](http://www.mbiproducts.com) or 440.322.6500)/Shadow-Coustic Acoustical Pads Model 1000P-1010N with 1" core, 1-psf weight, and 1.8 mil PVC cover.
1. Thickness: 2" thickness unless otherwise indicated.
  2. Size: Manufacturer's standard 24" by 48".
  3. NRC: 0.80 or better, with E 400 mounting.
  4. Cover: Flat black PVC.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Furnish layouts for inserts, clips and other supports required to be installed by other trades for support of wood slat ceilings.
  1. Install inserts, clips, and supports where not previously installed and where additional supports are required for complete installation.
- B. Coordinate with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment and partition systems.

#### **3.2 INSTALLATION**

- A. Install wood ceiling systems in accordance with referenced standards and manufacturer's recommendations and installation instructions.
  1. Finished ceiling to be true to lines and levels and free from warped, soiled, or damaged grid or wood slats.

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- B. Install ceiling systems in a manner capable of supporting superimposed loads, with maximum permissible deflection of 1/8" in 10 feet.
- C. Install after major above-ceiling work is complete.
  - 1. Coordinate location of hangers with other work.
  - 2. Ensure suspension system is located to accommodate fittings and units of equipment which are to be placed after installation of ceiling grid.
- D. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers, and related carrying channels as required to span required distance.
- E. Install ceiling suspension system to resist seismic loads as required by state and local codes, including extra hanger wires and compression supports.
- F. Hang system independently of walls, columns, ducts, pipes and conduit. Where suspension system members are spliced, avoid visible displacement of the longitudinal axis or face plane of adjacent members.
- G. Do not support lighting fixtures from or on ceiling suspension system if weight of fixture causes total dead load to exceed deflection capability.
  - 1. Support fixture loads independently or provide supplementary hangers located within 6" of each corner.
- H. Do not install fixtures so that suspension system will be eccentrically loaded; provide stabilizers where fixture installation would produce rotation of runners.
- I. Install edge moldings at intersection of ceiling and vertical surfaces, using maximum lengths, straight, true to line and level.
  - 1. Miter corners.
  - 2. Provide edge moldings at junctions with other ceiling finishes.
- J. Where required, expansion joints to accommodate movement and maintain visual closure without distorting system.
- K. Fit wood in place, free from damage and free from defects detrimental to appearance and function.
- L. Adjustment: Adjust sags or twists which develop in ceiling system and replace any damaged and any faulty component.

**END OF SECTION**

**SECTION 09 65 40**

**LINOLEUM SHEET FLOORING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide seamless linoleum sheet flooring with integral base (at Kitchen), and accessories as required for complete installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Appendix A: Finish and Materials Schedule.

**1.2 SUBMITTALS**

- A. Product Data: Furnish manufacturer's product literature.
- B. Samples: Submit each color and pattern selected of each type of flooring and exposed accessory.
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives and resilient flooring.

**1.4 SITE CONDITIONS**

- A. Ensure floor surfaces are smooth and flat with maximum variation of 1/8" in 10'-0".

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- B. Ensure concrete floors are dry and exhibit negative alkalinity, carbonizing and dusting.
- C. Maintain minimum 70-degree F air temperature at flooring installation area for 3 days prior to, during, and for 24 hours after installation.
- D. Store flooring materials in area of application; allow three days for material to reach same temperature as area of application.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Forbo Industries, Inc./Marmoleum.
- B. Tarkett/Linosom Linoleum.
- C. Gerflor USA/DLW Linoleum.

**2.2 MATERIALS**

- A. System Description: Provide linoleum sheet flooring and accessories.
- B. Regulatory Requirements, Flammability: Provide materials tested under ASTM E648, Flooring Radiant Panel Test, with results of 0.45 watts/sq cm or higher.
- C. Regulatory Requirements, Slip-Resistance: Hard surface finishes to comply with requirements of authorities having jurisdiction for slip-resistant hard surfaces, including general code requirements and for access for persons with disabilities.
- D. Linoleum Sheet Flooring: Marbleized linoleum consisting of oxidized linseed oil and natural resins mixed with wood or corkflour, limestone and pigments, conforming to ASTM F2034.
  - 1. Physical Characteristics:
    - a. Width: Nominal 6'-6" (200 cm).
    - b. Thickness (Gage): Nominal 1/8" (0.15" or 3.2 mm).
    - c. Backing: Jute.
  - 2. Welding Rods: Match flooring unless otherwise indicated.
  - 3. Integral Base Accessories (Kitchen Only): Provide manufacturer's standard cove support strips and finished metal top edge strips.
    - a. Base Height: 6" unless otherwise indicated.
    - b. Top Edge Strip: Type and color as selected by Architect from manufacturer's full range of types and colors.
  - 4. Colors and Patterns: As indicated, as selected by Architect from manufacturer's full range of colors and patterns where not otherwise indicated.

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- E. Edge Strips: Homogeneous vinyl, rubber, or linoleum, tapered or bullnose edge, color as selected by Architect to be compatible with flooring.
- F. Subfloor Filler: White premixed latex-cement paste designed for providing thin solid surface for leveling and minor ramping of subsurface to adjacent floor finishes.
  - 1. Use material capable of being applied and feathered out to adjacent floor without spalling.
- G. Primers and Adhesives: Waterproof; nontoxic types recommended by flooring manufacturer for specified material and application.
- H. Sealer and Wax: Type recommended by flooring manufacturer for material type and location.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Conform to ASTM F710 and manufacturer's recommendations for preparation.
- B. Remove subfloor ridges and bumps; fill low spots, cracks, joints, holes and defects with subfloor filler.
- C. Clean floor and apply, trowel, and float filler to leave smooth, flat hard surface; prohibit traffic until filler is cured.
- D. Test substrate for moisture content in accordance with flooring manufacturer recommendations; where moisture content exceeds recommendations take measures recommended by flooring manufacturer.

**3.2 INSTALLATION**

- A. Install linoleum sheet flooring in accordance with manufacturers' recommendations and installation instructions for type of flooring and substrates indicated.
- B. Spread cement evenly in quantity recommended by manufacturer to ensure adhesion over entire area of installation.
  - 1. Spread only enough adhesive to permit installation of flooring before initial set.
- C. Set flooring in place using methods to ensure full adhesion.
- D. Lay flooring with minimum seams, with pattern parallel to building lines to produce symmetrical pattern.
- E. Terminate resilient flooring at centerline of door openings where adjacent floor finish is dissimilar.
- F. Install edge strips at unprotected or exposed edges where flooring terminates.
- G. Scribe flooring to walls, columns, floor outlets and other appurtenances, to produce tight joints.

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- H. Seamless Installation (Typical): Install in accordance with manufacturer's recommendations.
  - 1. Lay out field so last slab ends minimum 6" from wall to allow space for router to operate around room perimeter.
  - 2. After installation of field, dry cut cove pieces, and leave in place.
  - 3. Set router so blade cuts groove to depth of approximately 3/4 of thickness of material.
    - a. Rout field seams in one direction only, being careful to keep groove centered on seam as closely as possible.
    - b. Groove cove pieces by laying out flat on floor and routing.
    - c. Spread adhesive for cove pieces and reinstall; roll thoroughly with hand roller.
  - 4. Weld so only small amount of melted bead overflows edges of groove.
  - 5. After seams have been welded and trimmed in one direction, weld seams running in other direction.
- I. Integral Cove Base (Kitchen Only): Provide integral coved base including cove support strip or filler and metal top edge strip.
  - 1. Install top edge strip level with floor lines, with tightly butted joints, mitered corners.
  - 2. Use longest top edge pieces available.
  - 3. Maintain minimum measurement of 48" between joints.

**3.3 CLEANING**

- A. Remove excess adhesive from floor, base and wall surfaces without causing damage.
- B. Clean, seal and wax floor surfaces in accordance with manufacturer's recommendations.
- C. Prohibit traffic from floor for 48 hours after installation.

**END OF SECTION**

**SECTION 09 77 20**

**FABRIC WRAPPED PANELS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide fabric wrapped panels including attachment devices and accessories as required for complete finished installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 09 77 30: Fiberglass wall panels.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Scheduling: Schedule installation of panels as close to Project completion as possible to prevent damage during construction and movement of materials.

**1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature including information verifying compliance with performance requirements.
- B. Shop Drawings: Show panel construction and attachment method.
- C. Samples: Furnish each type of fabric.
  - 1. Furnish corner of panel indicating construction.
- D. Maintenance Instructions: Furnish for each fabric.
  - 1. Include recommended cleaning materials and application methods, including precautions for cleaning materials that may be detrimental to surfaces if improperly applied.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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1.4 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store fabric panels in clean and dry area where temperatures are maintained at minimum 40 degrees F with normal humidity.
- B. Maintain surfaces and materials at minimum 60 degrees F for three days before and during application period.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

Manufacturers below, or approved equal:

- A. Armstrong Ceiling Systems.
- B. TECHLITE.

2.2 MATERIALS

- A. System Description: Provide fabric wrapped panels including attachment devices and accessories.
- B. Regulatory Requirements: Flame Spread/Smoke Developed maximum 25/450 when tested in accordance with ASTM E84.
- C. Panels: Manufacturer's standard fabric wrapped panel system.
  - 1. Basis of Design: Armstrong/Soundsoak 85 as indicated on Drawings.
  - 2. Noise Reduction Coefficient (NRC): 0.80 or better for A Mounting.
  - 3. Thickness: 1" unless otherwise indicated.
- D. Fabric: As indicated; if not indicated, as selected by Architect from panel manufacturer's full line of fabrics.
- E. Panel Fasteners: Manufacturer's standard concealed metallic fastener system.
- F. Accessories: Provide as indicated, as recommended by system manufacturer, and as required for complete finished installation.



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**2.3 FABRICATION**

- A. Secure fabric to panels without wrinkles, gaps, seams, or overlaps.
- B. Table square fabrics to provide completed panels with fabric yarns square and plumb.
- C. Bond fabric to panel.
- D. Tailor corners to maintain fabric flat and even.
- E. Completed Panels: Dimensionally stable fabric wrapped panel system.

**PART 3 - EXECUTION**

**3.1 INSPECTION**

- A. Ensure wall surfaces to receive panels are clean, true and free of irregularities.
- B. Ensure wall surface flatness tolerance does not vary more than 1/8" in 10'-0", nor vary at a rate greater than 1/16" per running foot.

**3.2 APPLICATION**

- A. Handle and apply panels in accordance with manufacturer's recommendations and installation instructions.
- B. Attach clip or magnetic system in accordance with panel manufacturer's recommendations and installation instructions. Secure to walls as indicated.
- C. Apply panels level and true.

**3.3 CLEANING**

- A. Remove debris and leave areas neat and clean.
- B. Replace damaged and defective panels.

**END OF SECTION**

**SECTION 09 77 30**

**FIBERGLASS WALL PANELS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide glass fiber reinforced polyester (FRP) resin fabricated wall panels with trim pieces and accessories as required for complete installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Appendix A: Finish and Materials Schedule.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this Section. Require attendance of those directly affecting work of this Section.
  - 1. Review installation procedures and coordination required with related work.
- B. Scheduling: Schedule installation of wall paneling as late in construction schedule as possible to prevent damage during construction.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature including recommendations for cleaning.
- B. Shop Drawings: Show detailing including panel configuration, anchorage, accessories, anchors, treatment of joints, penetrations, and exposed edges.
- C. Samples: Furnish fiberglass wall panels and exposed trim.
- D. Maintenance Instructions: Include manufacturer's recommended cleaning materials and application methods, including precautions in use of cleaning materials that may be detrimental to surfaces.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

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1.4 QUALITY ASSURANCE

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to pollution control for adhesives.
- B. Fabricator Qualifications: Firm with minimum five years' successful experience fabricating metal items like those required for Project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store panels in clean and dry area where temperatures are maintained at minimum 40-degrees F with normal humidity.
  - 1. Do not store in upright position.
- B. Take precautionary measures with adhesives and solvents to prevent fire hazards.

1.6 SITE CONDITIONS

- A. Maintain surfaces and materials at minimum 60-degrees F three days before and during application period.
- B. Provide continuous ventilation during work and after installation of wall covering.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

Manufacturers below, or approved equal:

- A. Crane Composites/Glasbord.
- B. Nudo Products, Inc./Fiber-Lite Panels or Marlite FRP Panels.
- C. Stabilit America/Glasteel FRP Liner Panel.

2.2 MATERIALS

- A. System Description: Provide glass fiber reinforced polyester resin fabricated wall panels, with trim pieces and accessories.
- B. Regulatory Requirements:

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1. Fire-Rating: Class III (UL Class C), maximum 200 flame-spread, 450 smoke developed, ASTM E84.
  2. Wet Wall Applications: Provide system acceptable by applicable authorities for use on walls in Janitor Closets at locations adjacent to mop sinks.
- C. Panels: Fiberglass reinforced plastic (FRP) panel system acceptable for use as toilet room wall panels, adjacent to water closets and to urinals; ASTM D5319.
1. Thickness: 0.090" nominal thickness.
  2. Antibacterial, Mold, and Mildew: Provide panels with integral antibacterial additives which are mold and mildew resistant.
  3. Surface: As selected by Architect from manufacturer's full range of surface textures.
  4. Color and Texture: As selected by Architect from manufacturer's full range of colors and textures.
- D. Trim Pieces: Manufacturer's standard matching moldings and trim pieces as required for complete, finished installation, and as required for joints, corners, and panel edges; suitable for applications indicated.
1. Color: Match panels.
- E. Adhesive: Nontoxic type recommended by wall covering manufacturer to suit application and complying with applicable limitations for volatile organic compound (VOC) emissions.
- F. Primer: Provide non-staining nontoxic release coat primer as recommended by wall panel manufacturer where panels are applied to gypsum board.
1. Primer: Type designed to allow removal of wall paneling from gypsum board without damaging paper facing of board, and without premature separation of wall paneling from wall.
- G. Fasteners: Concealed type only; types as recommended by system manufacturer.
- H. Accessories: As indicated, as recommended by system manufacturer, and as required for complete finished installation.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Ensure surfaces to receive wall paneling are clean, true, and free of irregularities, do not commence with work until surfaces are satisfactory.
- B. Ensure wall surface flatness tolerance does not vary more than 1/8" in 10'-0", nor vary at a rate greater than 1/16" per running foot.

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**3.2 INSTALLATION**

- A. Handle and install wall panels in accordance with manufacturer's recommendations and installation instructions.
- B. Cope and miter trim pieces.
- C. Securely adhere panels to wall surfaces; use blind nailing methods as required to support panels until adhesive dries; exposed mechanical fasteners shall not be acceptable.
  - 1. Install panels in maximum size increments available.
- D. Remove excess adhesive from edges and wipe seam clean with dry cloth towel.
- E. Install wall paneling before installation of plumbing, bases, hardware, and similar accessories.

**3.3 CLEANING**

- A. Clean panel system in accordance with manufacturer's instructions.
- B. Remove debris and leave areas neat and clean.
- C. Replace accessories.

**END OF SECTION**

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**SECTION 09 90 00**

**PAINTING AND COATING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide painting and finishing of exposed items and surfaces requiring field painting and finishing including shop primed items.
1. Specified surface preparation, priming and coats of paint are in addition to shop-priming and surface treatment specified under other sections of work.
  2. Painting and finishing include field finishing of exterior and interior items not listed as "Surfaces not to be Painted" unless clearly indicated otherwise.
  3. Painting and finishing include field finishing of select shop finished items such as mechanical grilles and registers and shop primed items such as access panels and louvers in doors, to match adjacent surfaces.
    - a. Match adjacent surfaces in color and sheen unless otherwise indicated.
  4. Field paint exposed bare and covered pipes, ducts, and hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work in occupied spaces.
  5. Wood Doors: Contractor option to factory finish or field finish, coordinate with Section 08 14 00 - Wood Doors.
- B. Surfaces Not to be Painted:
1. Finished items including finished metal surfaces.
  2. Walls and ceilings in concealed areas and generally inaccessible areas.
  3. Moving parts of operating mechanical and electrical units.
  4. Labels: Keep equipment identification and fire rating labels free of paint.
  5. Plastic smoke stops and weather-stripping at doors.
- C. Related Sections: Shop priming of ferrous metal items is included under various Specification sections.
1. Section 01 81 13: Sustainable Design Requirements.
  2. Section 06 40 00: Shop finishing of architectural woodwork.
  3. Section 09 54 20: Manufactured wood ceilings and soffits finish.
  4. Section 09 96 60: High build glazed coating.
  5. Appendix A: Finish and Materials Schedule.
  6. Appendix B: Paint Schedule.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical information, including paint label analysis and application instructions for each material.

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- B. Samples: Submit samples for review of color and texture; provide list of material and application for each coat of each finish sample.
  - 1. Brush-Outs: Submit samples of each color and material with texture to simulate actual conditions, on hardboard.
    - a. Submit 8" by 10" samples of wood finishes on actual wood surfaces; label and identify each as to location and application.
    - b. Submit samples of concrete masonry (maximum 4" square) defining filler, prime and finish coats.
  - 2. Field Samples: Duplicate painted finishes of approved samples on actual wall surfaces and components for approval prior to commencing work.
    - a. Size: Minimum 100 sf located where approved.
    - b. Components: One full component as directed.
    - c. Simulate finished lighting conditions for review.
- C. Manufacturer Certificates: Furnish certificates from each manufacturer stating materials are top quality lines and suitable for intended use on this Project.
- D. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- E. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for paints and coatings.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to job site in original, new, and unopened packages and containers bearing manufacturer's name and label, with:
  - 1. Name of material, color, and sheen.
  - 2. Manufacturer's name, stock number and date of manufacture.

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3. Contents by volume, for major pigment and vehicle constituents.
4. Thinning and application instructions.

**1.5 SITE CONDITIONS**

- A. Apply water-base paints when temperature of surfaces and surrounding air are between 50 and 90-degrees F.
- B. Do not apply paint in rain, fog, or mist; or when relative humidity exceeds 85 percent; or to damp or wet surfaces.
- C. Painting may be continued during inclement weather if areas to be painted are enclosed and heated within temperature limits specified.
- D. Provide additional temporary ventilation during interior application of paints to eliminate volatile organic compound (VOC) emissions from interior spaces as quickly as possible.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Benjamin Moore & Co.
- B. Sherwin-Williams Co.
- C. PPG Industries.
- D. Dunn-Edwards Corp.
- E. Kelly Moore Paint Co.
- F. Vista Paint Co.

**2.2 MATERIALS**

- A. System Description: Provide painting and finishing of exposed items and surfaces requiring field painting and finishing including shop primed items.
  1. Definition: "Painting" and "coating" as used herein means systems including primers, emulsions, enamels, stains, sealers, and fillers, whether used as prime, intermediate or finish coats.
- B. Regulatory Requirements:
  1. Volatile Organic Compound (VOC) Emissions: Furnish materials approved for use by applicable air quality management district for limitations of volatile organic compounds for architectural or special coatings as applicable.
  2. California Stair Stripes: Paint 2" stripes at stair nosing not otherwise marked, full tread and landing width, in accordance with California Code of Regulations, Title 24, Access Compliance requirements.



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- a. Exterior Stairs: Provide at landing and each tread in each stair run.
- C. Material Quality: Provide top line quality commercial grade (professional painter) paints; materials not bearing manufacturer's identification as their top line product shall not be acceptable.
  - 1. Primers: Provide premium grade primers recommended by paint manufacturer for substrates indicated and for finish systems specified.
  - 2. Undercoats and Barrier Coats: Provide undercoat paints produced by same manufacturer as finish coats; use only thinners approved by paint manufacturer and use only within recommended limits.
  - 3. Finish Coats: Provide finish coats capable of being washed with mild detergent without loss of color, sheen, or pigments.
    - a. Color pigments: Pure, non-fading, applicable types to suit substrates and service indicated; no lead content permitted.
  - 4. Finish Coat Coordination: Provide finish coats which are compatible with prime paints, undercoats, and barrier coats used.
    - a. Review other Specification sections in which prime paints are provided; ensure compatibility of total coatings systems.
    - b. Upon request from other trades furnish information on characteristics of finish materials proposed for use.
    - c. Provide barrier coats over incompatible primers or remove and prime as required.
    - d. Notify Architect in writing of any anticipated problems in use of specified coating systems with substrates primed by others.
- D. Colors and Finishes: Prior to commencement of painting work, Architect will furnish color chips for surfaces to be painted.
  - 1. Use of proprietary names in color selection is not intended to imply exclusion of equivalent products of other manufacturers.
  - 2. Final acceptance of colors will be from samples applied on site.
  - 3. Colors: As indicated on Finish Schedules, as directed by Architect where not otherwise indicated.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Inspection: Examine areas and conditions under which painting work is to be applied.
  - 1. Start of painting work indicates acceptance of surfaces and conditions of surfaces and conditions within any area.

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2. Where exposed items or surfaces are not specifically mentioned in Schedules, paint same as adjacent similar materials or areas.
  3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to a durable paint film.
- B. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified for substrate condition.
- C. Remove hardware, accessories, and items in place and not to be painted, or provide protection prior to surface preparation and painting; after painting reinstall removed items.
- D. Clean surfaces before applying paint; remove oil and grease prior to mechanical cleaning; program cleaning so contaminants from cleaning process do not fall onto wet, newly painted surfaces.
- E. Cementitious Materials: Prepare by removing efflorescence, chalk, dirt, grease, oils, and by roughening as required to remove glaze.
1. Determine alkalinity and moisture content of surfaces to be painted.
  2. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, neutralize before application of paint.
  3. Do not paint over surfaces where moisture content exceeds manufacturer's printed directions.
- F. Wood: Clean wood surfaces of dirt, oil, and other foreign substances; sandpaper smooth surfaces exposed to view and dust off.
1. Scrape and clean seasoned knots and apply thin coat of recommended knot sealer, before application of priming coat.
  2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job; prime edges, ends, faces, undersides, and backsides of wood.
  3. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler and sandpaper smooth when dry.
- G. Ferrous Metals: Touch up shop-applied prime coats wherever damaged using same type of primer as applied in shop or barrier coat compatible with finish paint.
1. Bare Surfaces: Clean surfaces that are not galvanized or shop-coated, of oil, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
  2. Galvanized Surfaces: Clean free of oil and surface contaminants, using non-petroleum-based solvent; primer and touch-up primer to be zinc-rich primer.
- H. Mix painting materials in accordance with manufacturer's directions.

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- I. Store materials in tightly covered containers; maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.
- J. Stir materials before application to produce mixture of uniform density and stir as required during application; do not stir surface film into material, if necessary, strain material before using.

**3.2 APPLICATION**

- A. Apply paint in accordance with manufacturer's directions; use applicators and techniques best suited for substrate and type of material being applied.
  - 1. Apply additional coats when stains or blemishes show through final coat, until paint is a uniform finish, color, and appearance.
  - 2. Provide extra attention during application to assure dry film thickness at corners and crevices is equivalent to that of flat surfaces.
  - 3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces; paint surfaces behind permanently fixed equipment and furniture with prime coat only.
  - 4. Finish doors on tops, bottoms, and side edges same as faces.
  - 5. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  - 6. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
  - 7. Sand lightly between coats when recommended by system manufacturer.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or prepared for painting as soon as practicable after preparation.
  - 1. Allow time between successive coatings to permit proper drying.
  - 2. Do not recoat until paint feels firm and does not deform or feel sticky under moderate thumb pressure.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer.
- D. Prime Coats: Apply to items not previously primed; recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat.

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- E. Finish Coats: Provide even texture; leave no laps, irregularity in texture, skid marks, or other surface imperfections.
  - 1. Opaque Finishes: Provide opaque, uniform finish, color, and coverage; cloudiness, spotting, holidays, brush marks, runs, sags, ropiness, and other surface imperfections are not acceptable.
  - 2. Transparent and Stained Finishes: Produce glass smooth surface film of even luster; provide with no cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, and other surface imperfections.
- F. Completed Work: Match approved samples for color, texture, and coverage; remove, refinish, or repaint work not accepted.

### 3.3 PAINTING SCHEDULE

- A. Exterior Work: Provide following paint systems and sheens unless otherwise indicated.
  - 1. Metal: Semigloss sheen.
    - a. 1st Coat: Touch-up primer, prime if none.
    - b. 2nd and 3rd Coat: Exterior 100% acrylic enamel.
  - 2. Concrete Masonry Units: Flat sheen.
    - a. 1st Coat: Surface filler.
    - a. 2nd and 3rd Coat: Heavy body waterproof acrylic emulsion.
    - b. Apply filler at rate to ensure coverage with pores filled.
  - 3. Opaque Finished Wood: Semigloss sheen.
    - a. 1st Coat: Primer undercoat.
    - b. 2nd and 3rd Coat: Exterior 100% acrylic enamel.
  - 4. Opaque Stained Wood: Flat sheen.
    - a. 1st Coat: Exterior opaque penetrating stain.
- B. Interior Work: Provide following paint systems and sheens unless otherwise indicated.
  - 1. Gypsum Board Systems: Eggshell (satin) sheen at walls, flat sheen at ceilings, semigloss sheen at toilet rooms.
    - a. 1st Coat: Universal primer.
    - b. 2nd and 3rd Coat: Interior latex or acrylic latex emulsion.
  - 2. Metal: Semigloss sheen.
    - a. 1st Coat: Touch-up primer, prime if none.
    - b. 2nd and 3rd Coat: 100% acrylic enamel.

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3. Opaque Finished Wood: Semigloss sheen.
  - a. 1st Coat: Primer undercoat.
  - b. 2nd and 3rd Coat: 100% acrylic enamel.
- C. Sheens: Comply with ASTM D523, reflectance of paint.
  1. Flat: 1-10.
  2. Satin: 15-30.
  3. Eggshell: 30-45.
  4. Semigloss: 45-75.
  5. Gloss: 75-100.

**3.4 CLEAN-UP, PROTECTION, AND REPAIR**

- A. Clean-Up: During progress of work, remove discarded paint materials, rubbish, cans and rags from site at end of each workday.
  1. Clean glass and paint-spattered surfaces immediately by proper methods of washing and scraping, using care not to scratch or damage finished surfaces.
- B. Protection: Protect work of other trades, whether to be painted or not; correct damage by cleaning, repairing, or replacing, and repainting, as acceptable to Architect.
  1. Provide "Wet Paint" signs to protect newly painted finishes.
  2. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- C. Repair: At completion of work of other trades, touch-up and restore damaged surfaces or defaced painted surfaces.

**END OF SECTION**

**SECTION 09 96 20**

**GRAFFITI RESISTANT COATING**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide non-sacrificial graffiti resistant coatings suitable for applications to surfaces indicated to receive graffiti resistant coating.
  - 1. Locations: Provide at following locations and as indicated on Drawings.
    - a. Concrete Site Walls and Benches: Section 03 32 30: Landscape Cast-in-Place Concrete.
    - b. CMU Walls: Section 04 22 10 – Architectural Concrete Unit Masonry.
    - c. Exterior Wood Siding: Section 07 46 20 – Wood Siding.
    - d. Exterior Wood Soffits: Section 09 54 20 – Manufactured Wood Ceilings.
    - e. Site Fencing: Section 32 31 14 – Site Fencing.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 09 90 00: Paints and coatings.
  - 3. Section 09 96 60: High-build glazed coating.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate graffiti resistant coating with surfaces upon which coating is to be applied to ensure coating does not change appearance of surface and does not detrimentally impact surface.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature.
- B. Samples: Furnish samples of graffiti resistant coating applied to each type of surface required for Project.
- C. Manufacturer Certification: Submit certification by manufacturer materials supplied comply with applicable codes and Contract Documents and are compatible with substrates indicated to receive graffiti resistant coating.
- D. Maintenance Instructions: Furnish manufacturer recommendations for cleaning of graffiti and other substances from system; note specific methods for determining type of material used for graffiti (marker, spray, etc.) and cleaning methods for each.

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- E. Maintenance Materials: Furnish supply of each type of cleaning material required for standard graffiti types clearly labeled regarding cleaning material type and specific applications relating to types of graffiti material cleans.
- F. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- G. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for paints and coatings.
- B. Field Sample: Apply minimum 50 sf of graffiti resistant coating where directed by Architect; sample installation establishes minimum workmanship standard. Approved field sample may be incorporated into Project.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store materials in accordance with manufacturer recommendations in dry, ventilated, protected area with minimum temperature of 45 degrees F. and away from fires or open flames.

**1.6 SITE CONDITIONS**

- A. Maintain minimum surface and ambient temperature of 45 degrees F. for 24 hours before, during and 24 hours after application, or until wall coating has cured.
- B. Ventilate area in which coating is being applied.
- C. Comply with graffiti coating manufacturer recommendations for maximum allowable moisture content of surfaces to receive coating; surfaces to have negative alkalinity.

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1.7 MAINTENANCE

A. Extra Stock: Provide minimum two full cases containing twelve 16 oz bottles each of chemicals necessary to remove graffiti from coating in factory sealed containers labeled regarding manufacturer, type, and locations applied in Project.

1. Deliver and store where directed by Owner prior to Substantial Completion.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

A. Basis of Design: Coval Technologies/Coval Anti-Graffiti.

B. Approved equal.

2.2 MATERIALS

A. System Description: Provide non-sacrificial graffiti resistant coatings suitable for applications to surfaces indicated to receive graffiti resistant coating.

B. Regulatory Requirements:

1. VOC: Coating to comply with applicable air quality management district limitations on volatile organic compound (VOC) emissions for architectural or special coating as applicable.

C. Performance Criteria:

1. System shall not require reapplication regardless of number of graffiti tagging's during 10-year period after application.
2. Coating shall show no signs of deterioration or change of appearance after graffiti removal during 10-year period after application including no ghost staining and no shadowing.
3. Cleaning chemicals shall be capable of removing 100% of all types of paint and graffiti materials from treated surfaces without damaging coating or substrate.
4. Coating shall not increase dirt pick-up of substrate.

D. Non-Sacrificial Graffiti Resistant Coating: Provide non-sacrificial antigraffiti coating system compatible with surfaces indicated to receive graffiti resistant coating and that does not change appearance of substrate when coating is dry.

1. Coating to be water clear, non-yellowing, free of waxes and urethane.
2. Cleaning Materials: Non-caustic, biodegradable, and recyclable, allowing graffiti removal without use of blasting equipment, hot water, or high-pressure wash equipment.



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**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Prepare surfaces in accordance with manufacturer's recommendations.
- B. Mask and protect surfaces, finishes and materials not receiving coating to provide true juncture lines and protect from overspray or damage.
- C. Remove and store finish hardware, fixture covers and accessories. Replace after coating has cured.
- D. Report defects of surfaces which could affect application of coating.
- E. Other painting and finishing shall be completed prior to application.
- F. Keep unauthorized traffic out of area in which coating is being applied.

**3.2 INSTALLATION**

- A. Apply coatings in accordance with manufacturer's recommendations and application instructions for each type of substrate receiving coating, by trained applicators.

**3.3 CLEANING**

- A. As work proceeds, clean up overspray and spatter, excess materials, and rubbish.
- B. Upon completion, and after coating has cured, clean and replace finish hardware, fixtures and fittings previously removed.
- C. Repair adjacent surfaces damaged by application of graffiti resistant coating.

**END OF SECTION**

**SECTION 09 96 60**

**HIGH-BUILD GLAZED COATINGS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide high-build glazed, tile-like, coating for concrete masonry at interior public restroom spaces in Public Restroom Building only.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 09 90 00: Standard painting and coating.
  - 3. Section 09 96 20: Graffiti Resistant Coating.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature.
- B. Samples: Submit samples of each color and pattern selected.
- C. Full Size Sample: Apply minimum 50 sf high-build glazed coating in location approved by Architect; sample installation establishes minimum workmanship standard. Approved sample may be incorporated into Project.
- D. Manufacturer Certificates: Furnish certificates from each manufacturer stating materials are top quality lines and suitable for intended use on this Project.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.

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2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
  - a. Comply with requirements including those relative to finish material pollution control for paints and coatings.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to job site in original, new, and unopened packages and containers bearing manufacturer's name and label, with:
  1. Name of material, color, and sheen.
  2. Manufacturer's name, stock number and date of manufacture.
  3. Contents by volume, for major pigment and vehicle constituents.
  4. Thinning and application instructions.
- B. Store materials in dry, ventilated, protected area with minimum temperature of 55 degrees F. and away from fires or open flames.

**1.5 SITE CONDITIONS**

- A. Maintain minimum surface and ambient temperature of 55 degrees F. for 24 hours before, during and 24 hours after application, or until wall coating has cured.
- B. Ventilate area in which coating is being applied.
- C. Moisture content of surface, maximum of 14 percent unless lower moisture content recommended by coating manufacturer; with negative alkalinity.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. PPG Industries, Pittsburg Paints, including Glidden Professional.
- B. Sherwin-Williams Company.

**2.2 MATERIALS**

- A. System Description: Provide high-build glazed, tile-like, coating.
- B. Regulatory Requirements:
  1. Sanitation: Coating material to comply with California Building Code requirements for smooth, hard nonabsorbent surface at walls at urinals and water closets, not adversely affected by moisture.
  2. Volatile Organic Compounds: Furnish materials approved for use by applicable air quality management district for limitations of volatile organic compounds for architectural or special coatings as applicable.
- C. High-Build Glazed Coating: Low volatile organic compound (VOC) content tile-like waterproof epoxy-based paint with color pigmentation.

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1. Basis of Design: PPG/Tile-8 HB Gloss Epoxy.
  2. Sheen: Tile-like gloss.
  3. Color: As selected by Architect.
- D. Filler Base: Type recommended by manufacturer for use with coating on masonry substrates indicated on Drawings.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Inspection: Examine areas and conditions under which painting work is to be applied.
1. Start of application of coating indicates acceptance of surfaces and conditions of surfaces and conditions within area.
  2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to a durable coating.
- B. Perform preparation and cleaning procedures in accordance with manufacturer's instructions and as specified for substrate condition.
1. Apply filler as required to fill voids in masonry and mortar and as required to ensure suitable substrate for finish.
- C. Mask and protect surfaces, finishes and materials not receiving wall coating to provide true juncture lines and protect from overspray or damage.
- D. Remove and store finish hardware, fixture covers and accessories. Replace after coating has cured.
- E. Report defects of surfaces which would affect application of wall coating.
- F. Other painting and finishing shall be completed prior to application.
- G. Keep unauthorized traffic out of area in which coating is being applied.

**3.2 INSTALLATION**

- A. Apply high-build glazed coating system in accordance with manufacturer's directions; use applicators and techniques best suited for substrate and type of material being applied.
1. Application to be by trained applicators.
- B. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer.
- C. Prime Coats: Reprime surfaces where there is evidence of suction spots or unsealed areas in first prime coat.

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- D. Finish Coats: Provide even texture; leave no laps, irregularity in texture, skid marks, or other surface imperfections.
  - 1. Provide opaque, uniform finish, color, and coverage; cloudiness, spotting, holidays, brush marks, runs, sags, ropiness, and surface imperfections are not acceptable.
- E. Completed Work: Match approved samples for color, texture, and coverage; remove, refinish, or recoat work not accepted.

**3.3 CLEANING**

- A. As work proceeds, clean up overspray and spatter, excess materials, and rubbish.
- B. Upon completion, and after coating has cured, clean and replace finish hardware, fixtures and fittings previously removed.
- C. Repair adjacent surfaces damaged by application of high-build glazed coatings.

**END OF SECTION**

**SECTION 10 14 00**

**SIGNAGE**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide general signage as indicated complete with attachment devices and accessories as required for complete installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Division 26: Photoluminescent exit signs.

**1.2 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature and indicate each sign type, style, color, and method of attachment.
- B. Shop Drawings: Furnish listing of sign types, lettering, and locations, along with dimensions of each sign.
  - 1. Computerized Output: Furnish computerized samples of signs and graphics at full scale duplicating final appearance.
  - 2. Dimensional Letter Signs: Furnish complete shop drawings regarding fabrication and method of attachment of dimension letter signs.
- C. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- D. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.

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- a. Comply with requirements including those relative to finish material pollution control for adhesives.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Package separately or in like groups of names, labeled as to names enclosed; include installation template, attachment system and installation instructions.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

Manufacturers below, or approved equal:

- A. ASI Modulex, ASI Sign Systems, Inc.
- B. Mohawk Sign Systems.
- C. Vomar Products, Inc.

2.2 MATERIALS

- A. System Description: Provide signage as indicated with attachment devices and accessories.
- B. Regulatory Requirements: Provide signs for assuring access for persons with disabilities in accordance with state and federal regulations.
  - 1. California Regulations: Comply with California Building Code.
  - 2. Federal Regulations: Comply with Americans with Disabilities Act (ADA) Standards.
- C. Building Dimensional Letter Signage: Provide individual letter signs as indicated.
  - 1. Aluminum: Manufacturer's standard for individual letter signs.
    - a. Finish: Clear anodized finish, AA-M12C22A41, Class I, AAMA 607.1.
  - 2. Fabrication: Fabricate dimensional letters as indicated, of minimum 0.25" plate or casting with edges and corners smooth and finished to match adjacent metal finishes.
  - 3. Attachment: Secure letters using connections concealed after installation; method subject to Architect approval.
    - a. Take care back welding does not damage exposed sign surfaces.
- D. Toilet Room Door Signs: Provide door signs conforming to California requirements for signs for toilet rooms; concealed mounting system.
  - 1. Material, Plastic: Manufacturer's standard colored plastic/photopolymer signs; color as indicated, as selected by Architect from manufacturer's full range of colors where not otherwise indicated.

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- a. Texture: Smooth.
- 2. Provide signs required by California Code of Regulations Title 24.
  - a. Gender Neutral Room: 12" diameter circle with equilateral triangle, vertex pointing up, superimposed on the circle; circle and triangle each 0.25" thick.
    - 1) Color of triangle shall contrast with color of circle which shall contrast with color of door face.
- 3. Colors: As selected to contrast with doors.
- 4. Symbols: As selected from manufacturer's standard symbols.
- 5. Adhesive: Type as recommended by sign manufacturer for type of substrate involved.
- E. Toilet Room Wall Signs: Provide signs conforming to California Building Code and ADA Standards for signs for permanent rooms, with inset symbols and with raised and Braille characters; concealed mounting system.
  - 1. Material, Plastic: Manufacturer's standard colored plastic/photopolymer signs; color as indicated, as selected by Architect from manufacturer's full range of colors where not otherwise indicated.
    - a. Texture: Smooth.
  - 2. Comply with California Building Code and ADA Standards for raised and Braille characters, pictorial symbols, finish, and contrasts requirements.
- F. Tactile Exit Door Signs: Provide colored plastic/photopolymer signs, conforming to California Building Code Section 1013.4 and ADA Standards for signs for permanent rooms, with tactile raised and Braille characters; concealed mounting system.
  - 1. Colors: As selected by Architect.
  - 2. Size and Style: As indicated on Drawings.
- G. Room Occupancy Limit Signs: Provide signs conforming to California and ADA Standards for permanent signs, total thickness 0.125"; concealed mounting.
  - 1. Material, Plastic: Manufacturer's standard colored plastic/photopolymer signs; color as indicated, as selected by Architect from manufacturer's full range of colors where not otherwise indicated.
    - a. Texture: Smooth.
  - 2. Sizes and Styles: As indicated on Drawings, as directed by Architect where not otherwise indicated.



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**2.3 FABRICATION**

**A. Signs and Graphics:**

1. Character Type: Characters on signs shall be raised 1/32" and shall be sans serif uppercase case characters accompanied by Grade 2 Braille.
2. Character Size: Raised characters shall be minimum 5/8" and maximum 2".
3. Finish and Contrast: Contrast between character, symbols and their background shall be 70% minimum and have non-glare finish. See California Building Code Section 11B-703.5.1
4. Grade 2 Braille: California (contracted) Grade 2 Braille shall be used wherever Braille is required.
  - a. Dots shall be 1/10" on centers with 2/10" space between cells, measured from second column of dots in first cell to first column of dots in second cell.
  - b. Dots shall be raised minimum 1/.40" above background.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. General: Install signs in accordance with manufacturer recommendations and installation instructions, free from distortions and defects.
- B. Dimensional Letter Signage: Locate dimensional letters with spacing based on full-size computer-generated installation drawings secured to structure as required to resist anticipated loads.
  1. Final Location: As approved in field by Architect based on full size drawings.
- C. Toilet Room Door Signs: Install signs on doors after doors are painted and finished.
  1. Location: Mount signs with centerline of sign between 58" and 60" height as required by applicable code.
  2. Install centered and level, in line, in accordance with the manufacturer's recommendations.
  3. Clean and polish, remove excess adhesive.
- D. Toilet Room Wall Signs: Install signs on walls after surfaces on which they are to be mounted are painted and finished.
  1. Location: Mount signs at 48" to 60" height as required by applicable codes on strike side of door.
  2. Install level, in line, in accordance with California Building Code and ADA Standards to allow a person to approach within 3" of signs without being within a door swing and without encountering protruding objects.

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3. Clean and polish, remove excess adhesive.
- E. Tactile Exit Door Signs: Install at doors with lighted "EXIT" signs; apply after walls are finished.
1. Location: Mount signs at 48" to 60" height as required by applicable codes on strike side of door.
  2. Install level, in line, in accordance with the manufacturer's recommendations and ADA Standards to allow a person to approach within 3" of signs without being within a door swing and without encountering protruding objects.
  3. Clean and polish, remove excess adhesive.
- F. Room Occupancy Limit Signs: Install signs after walls are finished.
1. Location: Mount signs at 48" to 60" height as required by applicable codes on strike side of door for room identification signs, where indicated for direction signs.
  2. Install signs level, in line, in accordance with the manufacturer's recommendations, California Building Code and ADA Standards.
  3. Clean and polish, remove excess adhesive.

**END OF SECTION**

**SECTION 10 22 20**

**OPERABLE PARTITIONS**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide paired panel, manually operated, top supported, folding operable partitions with retractable seals, including hardware and accessories as required for complete, operable system.
  - 1. Acoustical Closure: Review Contract Documents to ensure acoustical closure of adjacent construction matches operable partition acoustical performance to prevent flanking sound around partition into adjacent spaces.
    - a. Provide additional construction as required to ensure acoustical closure.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene not less than one week prior to commencing work of this Section. Require attendance of those directly affecting work of this Section.
  - 1. Review installation procedures and coordination required with related work.

**1.3 SUBMITTALS**

- A. Product Data: Furnish materials description, operation, and maintenance instructions.
- B. Shop Drawings: Show partition and track layout, details of head, jamb, and sill conditions, stacking arrangement, hardware, and operating mechanism.
  - 1. Indicate details of acoustical lead barrier over partitions system.
  - 2. Provide template drawings for items supported or anchored by permanent construction.
- C. Samples: Furnish samples of panel finish.
- D. Test Reports: Furnish copies of certificates by independent testing laboratories for following:
  - 1. STC rating.
  - 2. Flame spread classification.

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- E. Certificates:
  - 1. Installer Acceptance: Furnish letter from manufacturer indicating acceptance of installer for this Project.
- F. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- G. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Qualification of Installers: Minimum of five years successful experience in installing operable partitions and accessories on comparable projects.
  - 1. Acceptable to manufacturer of operable partition.

**1.5 WARRANTY**

- A. Extended Correction Period: Provide for correcting failure of operable partition system from proper operation, including acoustical characteristics.
  - 1. Special Warranty Period: Two years.
- B. Manufacturer's Warranty: Submit manufacturer's warranty including special manufacturer services as required for manufacturer's warranty.
  - 1. Period: Not less than 10 years.
  - 2. Manufacturer's warranty shall not detract from requirements of extended correction period nor from Owner's rights under implied and expressed warranties regardless of wording of manufacturer's warranty.

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**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Modernfold, a DORMA Group Company.
- B. Hufcor, Inc.
- C. Panelfold, Inc.

**2.2 MATERIALS**

- A. System Description: Provide manually operated folding operable partitions with retractable seals and including hardware and accessories.
  - 1. Partition Type: Top-supported, side-stacking, paired panel manually operated, with flush panels; manufacturer's STC 56 system.
    - a. Basis of Design: Modernfold/Acousti-Seal Encore system.
  - 2. Acoustical Closure: Provide acoustical closure of adjacent construction as required to match operable partition acoustical performance and as required to prevent flanking sound around partition into adjacent spaces.
- B. Laboratory Sound Transmission Performance: Sound Transmission Performance Rating of STC 56 or better as tested in accordance with full scale ASTM E90 test procedure.
  - 1. Test: Certified by N.S.S.E.A.
- C. Fire Performance Requirements: Provide products listed by Underwriters Laboratories (UL), or similar independent laboratory acceptable to applicable authorities.
  - 1. Flame Spread/Smoke Generation: Provide products meeting code requirements for maximum 25 flame spread and maximum 450 smoke density; Class A, ASTM E84.
- D. Panel Construction: Factory assembled.
  - 1. Panel Support Bolts: Fail-safe design that prevents loosening or backing out after panels have been installed.
  - 2. Panel Materials: Moisture resistant, and dimensionally stable.
- E. Track System: Overhead track designed for extra heavy duty.
  - 1. Panel Supports: Manufacturer's standard trolley assemblies, capable of universal movement.
- F. Deflection Compensation: Design system to accommodate specified long term dead load deflection of up to 1/2" at any point in span while maintaining operational and acoustical qualities.

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- G. Seals: Provide system with single mechanism to activate floor, head, and vertical seals; seals shall not contact floor or track during movement of panels; manufacturer's standard seals.
  - 1. Seal Materials: Resistant to fatigue and cleaning compounds and shall not mar floor or ceiling finishes.
  - 2. Floor Guide and Floor Attachments: Not permitted.
- H. Fixed and Operable Closure Jambs: Type designed to maintain acoustical seal at perimeter walls and junctions of operable partition; securely affix to building walls.
- I. System Supports and Anchors: ASTM A36 steel shapes as required to attach operable partitions to building structural system.
  - 1. Provide bracing at track intersections to resist panel impacts.
- J. Finish: Panel and door finish shall be heavy duty, glass fiber reinforced vinyl fabric, color and texture as selected by Architect.
  - 1. Apply finish to panels in shop. Return into vertical panel seams and mechanically fasten with removable astragal at panel edge.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine floor and overhead construction for conformance with tolerances; verify dimensions of in place and subsequent construction.
- B. Installation of partition shall constitute acceptance of existing conditions.

**3.2 INSTALLATION**

- A. Install operable partition system in accordance with manufacturer's recommendations and installation instructions as required to assure compliance with sound transmission requirements.
  - 1. Comply with ANSI E557, Standard Recommended Practice for Architectural Application and Installation of Operable Partitions.
  - 2. Lubricate bearings and sliding parts; adjust to ensure smooth, easy operation.
  - 3. Match operable partitions for color and pattern by using partition sections from cartons in same sequence as manufactured and packaged.
  - 4. Broken, cracked, chipped, damaged, and deformed partitions are not acceptable.
- B. Upon completion of installation, test operation of partition in presence of Architect's representative.
- C. Instruct Owner's personnel in operation and maintenance of partition.

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**3.3 CLEANING**

- A. Clean operable partition surfaces and adjacent surfaces soiled by operable partition work; avoid use of abrasive cleaners and solutions containing corrosive solvents.
  - 1. Remove and replace panels and adjacent construction damaged by installation or cleaning operations.

**END OF SECTION**

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**SECTION 10 28 00**

**TOILET ACCESSORIES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide toilet accessories with attachment hardware and rough-in frames as required for complete operational installation.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Section 06 20 00: Janitor closet mop holders.
  - 3. Appendix C: Restroom Fixtures and Accessories Cut Sheets.

**1.2 SUBMITTALS**

- A. Product Data: Submit product data illustrating each accessory at large scale.
- B. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.
- C. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for adhesives.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building in.



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- B. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.
- C. Pack accessories individually, protect each item and its finish.

**1.5 SITE CONDITIONS**

- A. Protect adjacent or adjoining finished surfaces from damage during installation of work of this section.
- B. Before starting work notify Architect in writing of conditions detrimental to installation or operation of units.
- C. Verify with Architect exact location of accessories.

**1.6 WARRANTY**

- A. Extended Correction Period:
  - 1. Replace mirrors which exhibit signs of desilvering or distortion.
  - 2. Period: Two years.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Bobrick Washroom Equipment, Inc.
- B. Bradley Corporation.
- C. American Specialties, Inc.
- D. Dyson, Inc.
- E. Foundations Worldwide, Inc.

**2.2 MATERIALS**

- A. System Description: Provide toilet accessories with attachment hardware and rough-in frames.
  - 1. Provide standard materials and finishes for accessories listed; where more than one material or finish is available and not otherwise indicated provide as selected by Architect from manufacturer's standard materials and finishes.
- B. Regulatory Requirements - Access for Persons with Disabilities: Comply with California Building Standards Code and Americans with Disabilities Act (ADA) Standards.

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- C. Stainless-Steel Sheet: ASTM A666, commercial grade, Type 304, gages as standard with manufacturer of specified items.
- D. Stainless-Steel Tubing: ASTM A269, commercial grade, seamless welded.
- E. Mirror Glass: ASTM C1036, q1 mirror select clear float glass with full silver coating, copper coating and organic coating; minimum 1/4" thick.
- F. Sheet Steel: ASTM A1008, cold rolled stretcher leveled; minimum G90 galvanized coating, ASTM A924 and A653.
- G. Adhesive: Epoxy type contact cement as recommended by accessory manufacturer; comply with applicable requirements for limitations on volatile organic compound (VOC) emissions.
- H. Fasteners, Screws, and Bolts: Hot-dipped galvanized; as recommended by accessory manufacturer for component and substrate.
- I. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing and supply.
  - 1. Provide minimum six keys to Owner representative.

### 2.3 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from one sheet of stock, free of joints.
- C. Fabricate units with tight seams and joints, exposed edges rolled; hang doors and access panels with continuous piano hinges; provide concealed anchorage where possible.
- D. Provide steel anchor plates and anchor components for installation on building finishes.
- E. Form surfaces flat without distortion; maintain flat surfaces without scratches and without dents; finish exposed edges eased, free of sharp edges where potential exists for physical contact.
- F. Back paint components where contact is made with building finishes, to prevent electrolysis.
- G. Hot-dipped galvanize ferrous metal anchors and fastening devices.
- H. Assemble components in shop; package complete with anchors and fittings.

### 2.4 FINISHES

- A. Exposed Finishes: Stainless steel, number 4, satin finish; satin chrome finish acceptable where stainless steel not available for accessory item listed or scheduled.

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- B. Concealed Surfaces: Treat and clean, spray-apply one coat primer and baked enamel finish.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Provide templates and rough-in measurements.

**3.2 INSTALLATION**

- A. Install accessories in accordance with manufacturer's printed instructions using fasteners appropriate to substrate.
- B. Install true, plumb and level, securely and rigidly anchored to substrate.
- C. Use tamper-proof, security type fasteners.
- D. Adjust accessories for proper operation and verify mechanisms function smoothly.
- E. Replace damaged and defective items.
- F. Clean and polish exposed surfaces after removing temporary labels.

**3.3 TOILET ACCESSORIES SCHEDULE**

- A. Refer to Drawings.

**END OF SECTION**

**SECTION 11 31 00**

**APPLIANCES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide residential type appliances with options and accessories as required for complete finished operational installation.
- B. Related Sections:
  - 1. Section 06 40 00: Custom cabinets and countertops.
  - 2. Division 22: Plumbing connections.
  - 3. Division 26: Electrical connections.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature for each type of appliance, including data indicating compliance with requirements and color selection.
- B. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

**1.3 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Certification Labels: Provide appliances which bear appropriate labels as follows:
  - 1. Energy Ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.
  - 2. UL Standards: UL labels required.

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1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver appliances in manufacturer's undamaged protective containers, after spaces are ready to receive them.

**PART 2 - PRODUCTS**

2.1 SYSTEMS MANUFACTURERS

Manufacturers listed below, or approved equal:

- A. General Electric Co., Major Appliances Division.
- B. Whirlpool Corp.
- C. Maytag Corp., including Amana Appliances.

2.2 MATERIALS

- A. System Description: Provide residential type appliances with options and accessories.
- B. Performance Requirements: Provide appliances with Energy Star rating unless otherwise indicated.
- C. Appliances:
  - 1. Options: Where appliances are available with options and options are not specifically indicated provide best quality options offered with appliance number indicated unless otherwise directed by Architect.
  - 2. Colors and Finishes: Provide colors and finishes as indicated for appliances.
    - a. Where not otherwise indicated provide finishes as selected by Architect and Owner from manufacturer's full range of colors and finishes including stainless steel.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine substrates and conditions under which appliances are to be installed.

3.2 INSTALLATION

- A. Install appliances in accordance with manufacturer's instructions.
- B. Coordinate with mechanical and electrical trades as necessary for proper service connections.
- C. Ensure operating parts work freely and fit neatly.

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3.3 ADJUSTING

- A. Adjust hardware and moving parts as necessary.

3.4 PROTECTION

- A. Protect appliances until Substantial Completion.
- B. Repair or replace damaged parts, dents, buckles, abrasions, or other defects affecting appearance or serviceability, so appliances are undamaged at time of Substantial Completion.

**END OF SECTION**

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**SECTION 12 10 00**

**ARTWORK COORDINATION**

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**1.1 SUMMARY**

The City shall furnish and install Artwork for this project, under a separate contract between the City and an Artist managed by the Civic Arts Program. All communications regarding Artwork coordination must be directed to the Civic Arts Program staff who will communicate with the Artist. The Contractor shall not communicate directly with the Artist without the Civic Arts Program staff present.

**1.2 RELATED REQUIREMENTS**

Section 01 81 13: Sustainable Design Requirements.

**1.3 SCHEDULING**

The Contractor shall include the following Artwork coordination activities on the project schedule and provide schedule updates to the Civic Arts Program staff:

1. Date for Artwork Pre-Installation Conference.
2. Date for inspection by City of Artwork installation site prepared to receive Artwork.
3. Dates for Artwork installation.
4. Date for Artwork acceptance: Upon completion of installation, the Contractor shall schedule a joint survey with the Artist and Civic Arts Program staff for acceptance of the Artwork prior to the Contractor assuming responsibility for Artwork until completion of the project.
5. NOTE: The schedule shall allow for float time and postponement of Artwork installation due to inclement weather.

**1.4 CONTRACTOR RESPONSIBILITIES**

The Contractor shall provide the following:

1. Schedule updates for Artwork coordination activities.
2. The Contractor shall provide no less than a 14-calendar day advance notice and confirm with the City Representative required attendance by the Civic Arts Program staff and the Artist for all Artwork-related tasks.
3. Procure and install a cement or plywood backer board at artwork location. Exact material to be coordinated with Civic Arts Program staff prior to installation.
4. Procure and install dedicated artwork lighting at artwork location.

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5. Site access for the Artist and his/her Installer to include use of: restrooms, water and electricity.
6. Shop drawings and as-built drawings upon request by City.
7. During the Artwork installation, the Contractor shall provide for secure storage of Artwork not yet installed.
8. Upon completion of the Artwork installation, the Contractor shall assume responsibility for protecting the Artwork from any damage through completion of the project. In the event the Artwork is damaged, only the Artist and Art Installer shall be allowed to make such repairs and shall be fully compensated by the Contractor for time and materials required to make such repairs.
9. The Contractor shall provide insurance with its Builder's Risk Policy for the full value of Artwork, in the event of any damage caused during construction.
10. Prior to the opening of the facility, the Contractor shall remove protective coverings under the direction of the Artist and Art Installer.

1.5 ACCEPTANCE OF ARTWORK BY CITY

- A. The City shall inspect and document Artwork at the completion of the Artwork installation.
- B. The City shall approve or reject the condition of the Artwork upon notice of substantial completion of the project as part of project closeout procedures.

END OF SECTION



**SECTION 12 24 00**

**WINDOW SHADES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide both manually operated and electrically operated window shade systems with hardware and accessories as required for complete, finished installation.
  - 1. Lower Windows: Provide manually operated window solar shades.
  - 2. Upper Windows: Provide electrically operated shades including remote control.
- B. Related Sections:
  - 1. Section 01 81 13: Sustainable Design Requirements.
  - 2. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. NFPA 701: Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.
- B. FS CCC-T-191b: Flame Retardancy of Textiles.

**1.3 SUBMITTALS**

- A. Product Data: Furnish manufacturer's literature.
- B. Shop Drawings: Show hardware, clearances, and operation of shades with specified system.
  - 1. Layout of openings and control locations subject to Architect approval where not clearly indicated.
- C. Samples: Submit samples of each fabric indicating finishing of top, bottom and sides, and section of frame indicating finish.
- D. Certificate of Flame Proofing or Flame Resistance: Submit certification, recommendations, and instructions for laundering of specified fabrics and maintenance of entire installation.
- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

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- F. Refer to Section 01 81 13 Sustainable Design Requirements for LEED submittal requirements.

**1.4 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
- B. Manufacturer Qualifications: Provide window shades as complete units produced by one manufacturer, including hardware, accessory items, mounting brackets and fastenings.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver shades until installation area is ready for shade installation.
- B. Number and identify shades as to locations in Project.

**1.6 SITE CONDITIONS**

- A. Before installation, physically measure and inspect space after limiting conditions are established.
  - 1. Note floor and ceiling may not be level.

**PART 2 - PRODUCTS**

**2.1 SYSTEMS MANUFACTURERS**

Manufacturers below, or approved equal:

- A. Mecho Shade Corporation.
- B. Lutron Electronics Co.
- C. Nysan Solar Control Inc, a Hunter Douglas Company.

**2.2 MATERIALS**

- A. System Description: Provide both electrically operated and manually operated solar window shades as indicated, with hardware and accessories.
- B. Regulatory Requirements:
  - 1. Flame Retardant Materials: Approved by California State Fire Marshal's Office.

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2. Fire Resistant Fabrics: Required to have passed one of following:
    - a. CBC/CFC 806.4 Flame resistant in accordance with CCF, Title 19, Division 1, Chapter 8.
    - b. FS CCC-T-191, test 5903.
  3. Accessibility for Persons with Disabilities: Access to controls to be within code required reach range, with code required clear space, and with code required maximum 5-lbs. operating force.
- C. Systems: Provide shades as complete units produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.
- D. Lower Window Manual Shade Operating System: Manual type chain operated roller shade system with adjustable slip clutch.
1. Operating System: Provide upper and lower stop limits to prevent over-winding and unrolling.
  2. Provide for left or right-hand operation.
- E. Upper Window Electrical Shade Operating System with Remote Controls:
1. Motor: Fractional horsepower asynchronous motor with reversible capacitor designed for intermittent operation; thermally protected, totally enclosed.
    - a. Provide solenoid activated disk brake and internal limit switches which are externally adjustable.
  2. Speed: Minimum 12-rpm.
  3. Control: Provide remote control for upper windows to allow management to operate shades from management office.
    - a. Solar Shades: Maintained double pole, double throw switch located remotely; each room shall have one switch, multiple shades shall operate simultaneously.
      - 1) Motor logic controllers shall be provided where control of three or more shades is required.
    - b. Ganging Shades: Cooperate with Owner to determine how upper window solar shades are to be ganged to allow Owner to control specific areas, not limited to a single switch.
- F. Fabrics: Manufacturer's standard fire-resistant fabrics; colors and patterns as selected by Architect from manufacturer's full range.
1. Solar Shades: Manufacturer's standard fire-resistant glass cloth fabric.
  2. Colors: As selected by Architect from manufacturer's full range of colors.

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- G. Shade Pockets: Mount shades as indicated on Drawings, as approved by Architect where not otherwise indicated.
- H. Accessories: Provide accessories, brackets, fittings, and fastenings as necessary for proper operation and installation of shades; conceal fasteners or finish flush, painted to match exposed metal finish.
- I. Exposed Metal Finish: Manufacturer's standard white painted finish unless otherwise directed by Architect.

### 2.3 FABRICATION

- A. Fabric: Heat set to prevent edges from unraveling when knife cut.
  - 1. Fabricate shades with threads square.
  - 2. Allow sufficient overage to provide finished shades required from single run of fabric.
- B. Cutting: Use single widths of fabric with no center seams for each shade; edge seal with hot knife system.
  - 1. Lengths: Finish length so bottom clearance is flush at blackout shades and within 1/2" for solar shades, with 1/4" tolerance acceptable.
- C. Shade Mounting System: Allow for shade removal and replacement without disassembling hardware assembly.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Inspect site conditions prior to installation for conditions that could affect proper installation and operation of shades.
- B. Beginning installation signifies acceptance of substrates and conditions.

### 3.2 INSTALLATION

- A. Install shades in accordance with manufacturer's recommendations and installation instructions.
  - 1. Install shades level, plumb, secure, and at proper height; cooperate with other trades for securing shades to substrate and finished surfaces.
- B. Hang shades to be straight and even, employing hand sewing of seams and hems as necessary for carefully matched installation with even, horizontal top and bottom hems, and quiet, smoothly operating system.
- C. Fabricate and install shades so when open, closed or while operating shades are not abraded by window frame, ceiling, or sill.
- D. Testing: Test remote operation of upper window shades from Management office; label switches to indicate room, walls, and windows being controlled; include red light at each switch to indicate when shade is closed, light to be out when shade is open.

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**3.3 ADJUSTING**

- A. Thirty days after hanging shades, inspect installation for fabric shrinkage or expansion or other variations and rehang as necessary for conformance to specified tolerances.

**END OF SECTION**

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**SECTION 12 93 00**

**SITE FURNISHINGS**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

A. Furnish all labor, materials, tools and equipment necessary to install site furnishings as indicated on the plans and as specified herein; including components and accessories required for a complete installation, including but not limited to the following components:

1. Benches
2. Bike racks
3. Bollards
4. Trash Receptacles
5. And as shown on the Drawings
6. All furnishings are as approved equivalent.

**1.02 RELATED SECTIONS**

- A. Planting: Section 32 90 00
- B. Concrete Paving: Section 32 13 13

**1.03 QUALITY ASSURANCE**

A. Materials and method of construction to comply with the following standards:

1. American Institute of Steel Construction (AISC)
2. American Iron and Steel Institute (AISI)
3. American National Standards Institute (ANSI)
4. American Society of Testing and Materials (ASTM)
5. American Welding Society (AWS)
6. American Disabilities Association 1990 (ADA)
7. California Accessibility Reference Manual, Title 24
8. Federal Hazardous Substances Act

B. Concrete castings to be fabricated by firms normally in the business of producing architectural castings of the type indicated.

**1.04 SUBMITTALS**

- A. Submit in accordance with Section 01 33 00.
- B. Catalog cut sheets for standard manufactured items indicating color, size, finish, material and method of attachment.
- C. Shop drawing for attachment and installation of all manufactured items.

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- D. Sample for each type of product specified showing finish and color (approx. one pint or 4" square sample as applicable).
- E. Maintenance data for site furnishings: Include in maintenance manuals. Include Product Data for care of products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.
- F. Warranty information for each material and/or site furnishing.

**1.05 COORDINATION**

- A. Coordinate the work of all trades, including plumbers, electrical, etc., such that there is ample time to install related work, sleeves and conduit, prior to installation of furnishings.

**1.06 PRODUCT HANDLING**

- A. Ship and store materials in such a way as to prevent damage due to stains, discoloration, scratches, dirt or any other causes. Store unassembled components indoors in a clean, dry location. Store and handle materials in such a way as to prevent abrasion or other damage.

**1.07 FABRICATION & WORKMANSHIP**

- A. Fabricate all site furnishings in the shop. Fabricate as completely as possible to keep field assembly to a minimum.
- B. Provide all miscellaneous metal items and adhesives required for completion of the work, even though not specifically shown or identified.
- C. Provide Owner with tools to loosen and tighten all vandal proof connectors.
- D. Provide Owner with touch up paint for all site furnishings; one container for each color installed. Provide all spare parts and extra hardware left over after installation of site furnishings.
- E. Conceal all connections where possible; otherwise use vandal-proof connectors.
- F. Workmanship and finish in accordance with good practice and the construction documents. Finish work to be firm, in true alignment, and properly squared, with smooth clean uniform appearance, without waves, distortions, holes, cracks, stains or discolorations. Joinings to be close-fitting. Finish work to have no exposed unsightly anchors or fastenings and present no hazardous, unfinished or unsafe protrusions, offsets, burrs, raw edges, or sharp corners. All work to have provisions for expansion and contraction or shrinkage as necessary to prevent cracks, buckling and warping.

**1.09 WARRANTY**

- A. Warranty all furnishing, components and workmanship to remain free of defects due to faulty materials or workmanship, corrosion, or deterioration for a period of 24 months

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after the date of completion and Final Acceptance, supplemental coverage if offered is enforced; unless otherwise stated.

**1.08 DEFINITIONS**

- A. The "Owner's Representative" is the person, appointed by the Owner, to represent their interests. The Owner's Representative will be on site frequently and regularly during construction. Where needed, the Owner's Representative will identify the need for field visits by the landscape architect or other consultants.

**PART 2 - PRODUCTS**

**2.01 GENERAL**

A. Miscellaneous Metals

- 1. Bolts and nuts - ASTM 307, Grade A, hot dip galvanized.
- 2. Fasteners, stainless steel - ANSI type 302, non-magnetic.
- 3. Anchor bolts formed for anchorage in concrete.
- 4. Hot dip galvanize all exterior ferrous metal items attached to concrete, per ASTM A123, A153, A385, or A386 as applicable.

- B. Provide all miscellaneous metal items required for completion of the Contract, even though not specifically shown or identified.

- C. Installation made with vandal-proof connectors where possible.

**2.02 SITE FURNISHINGS**

- A. As shown on Drawings and as included in the Specifications or approved equivalent.

**PART 3 - EXECUTION**

**3.01 INSPECTION**

- A. Prior to commencement of work described in this section, carefully inspect installed work, and verify all such work is correct and complete. Immediately notify the Owner's Representative of any discrepancy before proceeding with work.

**3.02 INSTALLATION**

- A. Install all furnishings in accordance with manufacturer's recommendations.
- B. Furnish all anchors, bolts, and appurtenances required for complete installation to ensure proper fit and accurate placements.
- C. Place all furnishings in the proper location, plumb, level, square, in true alignment and firmly anchored and so does not rock.
- D. Install furnishings in concrete footings per the manufacturer's recommendation.



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**3.03 ADJUSTING**

- A. Check all bolts, nuts and other connections for proper fit and tightness.
- B. Check components for proper alignment, fit and tolerances.
- C. Check all finishes for damage. Replace damaged components.

**3.04 CLEANING**

- A. At the end of each working day, remove all empty containers from the site, and remove all debris from walks and paving. Sweep all walks and paving clean.
- B. Final Clean-up: In addition to the daily clean-up, haul from the site and legally dispose of all waste materials.
- C. Immediately prior to acceptance, clean all exposed surfaces of soil and discoloration. Follow recommendations of component manufacturer for cleaning methods and materials.

**3.05 PROTECTION**

- A. Protect all furnishings from damage by subsequent work. Replace damaged furnishings at no additional cost to Owner.

**END OF SECTION**

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**SECTION 21 05 00**

**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

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**PART 1 GENERAL**

**1.1 SUMMARY**

- A. The intent of Division 21, Fire Suppression Specifications, and the accompanying Drawings is to be a reference for preliminary locations and routing of fire protection system components. Not all components required for a complete system are shown, including but not limited to standpipes, hose connections, sprinkler heads, fire protection zones, air compressors, dry valves, piping, appurtenances, connections, etc.
- B. Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, fire marshal, owner's insurance underwriter, and any other authority having jurisdiction.
- C. Division 21, Fire Suppression Specifications and the accompanying Drawings are complimentary and what is called for by one as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.
- D. Imperative language is frequently used in Division 21, Fire Suppression Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- E. Piping and sprinkler head locations meet the Architectural design intent for the building in addition to applicable code. The right is reserved to make any reasonable changes in sprinkler head location prior to roughing-in, without cost impact. Deviation from the general routing piping mains, standpipes, or other routing shown must be approved by the architect prior to installation. If additional space is required for fire protection system components, Architect to make a formal request.
- F. Heat, heat trace, and associated power required for fire protection system components are the responsibility of the design-build contractor. Request approval from the electrical engineer to use spaces in electrical panels provided at no additional cost.
- G. Furnish piping, pipe fittings, valves, gauges, and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.
- H. The General and Supplemental Conditions apply to this Division, including but not limited to:
  - 1. Drawings and specifications.
  - 2. Public ordinances, permits.
  - 3. Include payments and fees required by governing authorities for work of this Division.
- I. Division 01, General Requirements, applies to this Division.

**1.2 RELATED SECTIONS**

- A. Section 21 10 00, Water Based Fire Suppression Systems
- B. Section 01 18 13 Sustainable Design Requirements.

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1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment's within this specification contain these banned substances, provide complying products and equipment's from approved manufacturers with equal performance characteristics.
2. General:
  - a. Conform Work and materials to requirements of the local and State codes, fire marshal, the owner's insurance underwriter, and any other authority having jurisdiction; and Federal, State and other applicable laws and regulations.
3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
4. Fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements.

B. New materials and Equipment:

1. Good work quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus: Build and install to deliver full rated capacity at the efficiency for which it was designed.

D. The entire system and apparatus operate at full capacity without objectionable noise or vibration.

E. For remodel projects, the existing system must remain fully operational, or provisions made to provide coverage while the new system is being installed. New installation switchover requires minimal down time. Provide method to maintain fire protection or fire watch during any system down time. Include any related cost for materials or labor that is needed for providing continuous coverage.

F. Install equipment level and true. Housekeeping pads and curbs account for floor or roof slope.

G. Materials and Equipment:

1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.

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4. Equipment scheduled by performance or model number is considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.
- H. Workmanship:
1. General: Install materials in a neat and professional manner.
  2. Manufacturer's Instructions:
    - a. Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21, Fire Suppression Specifications, obtain clarification before starting work.
- I. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
  2. Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
  3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
  4. Do not pierce beams or columns without permission of Architect and then only as directed.
  5. New or existing work cut or damaged restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.
- 1.4 SUBMITTALS
- A. Certified Shop Drawings:
1. Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required.
    - a. Prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items.
    - b. Prepare new drawings and not reproductions or tracings of Architect's Drawings.
    - c. Overlay drawings with shop drawings of other trades and check for conflicts.
    - d. Prepare Drawings at same size as Architect's Drawings with similar title block and identifying Architect's Drawing number or any reference drawings. Prepare in two-dimensional format.
    - e. Fully dimension including both plan and elevation dimensions.
    - f. Shop drawings cannot be used to make scope changes.

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g. Include the following information and content within Shop Drawings:

- 1) Sprinkler head layout drawings overlaid with ceiling and floor plans.
- 2) Sprinkler floor plans, including piping, equipment, and heads to a minimum of 1/4-inch equals 1-foot scale or same as plans, whichever is greater.
- 3) Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
- 4) Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
- 5) Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
- 6) Fabrication drawings of radiant ceiling panels, architectural metal ceiling, including panel penetrations for lighting, sprinkler heads, fire alarm devices, and any other penetrations.

2. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable
2. Provide product data sheets of each type of sprinkler head.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Hydraulic Calculations:

1. Submit hydraulic calculations (specific to the installation) within the same package as the shop drawings. Shop drawings will not be reviewed without the associated hydraulic calculations.

D. Test Reports:

1. Submit certificates of completion of tests and inspections.

E. Submission Requirements:

1. Refer to Division 01, General Requirements for additional requirements related to submittals.
2. Shop Drawings:
  - a. Provide electronic (PDF) set of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the

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- Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.
- b. Provide electronic set Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
  - c. Re-submit electronic set of approved Drawings (with any previous comments incorporated) to Architect for final review prior to submitting to insurance underwriter and Fire Marshal.
3. Product Data:
- a. Submit electronic copies product data for Work of Division 21 in PDF format with each item filed under a folder (or electronically bookmarked) and labeled with its respective specification section number, article, paragraph, and mark, if applicable.
  - b. Include a complete index in the original submittal. Indicate both original items submitted and note any items that will be submitted at a later date to avoid delay in submitting.
  - c. Submit product data in a single submittal. Partial submittals will not be accepted. Re-submit any additional product information in the same format as the original. Upon receipt of the returned re-submittals, incorporate into a single submittal for close-out package.
- F. Contractor Responsibilities:
- 1. See that submittals are submitted at one time and are in proper order.
  - 2. Obtain approvals and permits from the AHJ.
  - 3. Ensure that equipment will fit in the space provided prior to purchase of equipment.
  - 4. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.
- 1.5 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS
- A. Refer to Division 01, General Requirements for additional requirements.
  - B. Submit final electronic package of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
  - C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals including all phases of control.
  - D. **Furnish competent engineer knowledgeable in this building system for minimum of one 8-hour day to instruct Owner in operation and maintenance of systems and equipment. Keep a log of this instruction including dates, times, subjects, and those present and present such log when requested by Architect.**

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- E. As required, provide fire pump as-constructed data, and installation, start-up and testing manuals.

**1.6 AS-BUILT DRAWINGS**

- A. Provide **3D model** and as-built drawings at the end of the project.
- B. 3D model in the following format:
  - 1. AutoCAD
  - 2. Revit
  - 3. **Navisworks**
- C. As-built drawings in PDF format.
  - 1. Drawings include the following:
    - a. Project specific title block.
    - b. Notations reflecting the as-built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

**1.7 PROJECT CONDITIONS**

- A. Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.
- B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

**1.8 WARRANTY**

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

**1.9 PROVISIONS FOR LARGE EQUIPMENT**

- A. Make provisions for the necessary openings in building to allow for admittance of equipment.

**1.10 SUBSTITUTIONS**

- A. Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

**PART 2 PRODUCTS**

**2.1 ACCESS PANELS**

- A. Furnish under this Division as specified in another Division of work.

**2.2 PIPE SLEEVES**

- A. Interior Wall and Floor Sleeves:

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1. 18 gauge galvanized steel or another pre-approved water tight system.
  - B. Interior Wall and Floor Sleeves (fire rated):
    1. Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
  - C. Exterior Wall and On Grade Floor Sleeves:
    1. Cast Iron
- 2.3 FLOOR, WALL AND CEILING PLATES (ESCUTCHEONS)
- A. Furnish stamped split type plates as follows:
    1. Floor Plates:
      - a. Cast brass, chromium plated.
    2. Wall and Ceiling Plates:
      - a. Spun aluminum.

**PART 3 EXECUTION**

3.1 COORDINATION

- A. Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.
- B. Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.

3.2 GENERAL

- A. Install fire protection systems to serve the entire building.
- B. The drawings indicate approximate locations of piping, sprinkler zones, and types of systems. The drawings do not indicate the locations of sprinkler heads in ceiling areas. Locate sprinklers in the center of ceiling panels and symmetrically within rooms and down corridors, coordinated with and in pattern with lights and grilles. Deviations must be approved.
- C. Location of heads shown in ceiling areas may be changed if required by code requirements, but only after review by the Architect for new head locations for each specific instance.

3.3 SLEEVES

- A. Interior Floor and Wall Sleeves:
  1. Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved water tight system.
- B. Sleeves through Rated Floors and Walls:
  1. Similar to interior sleeves except install fire-rated system approved by Authority Having Jurisdiction and Owner's Insurance Underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves Below Grade:



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1. Large enough to allow for caulking and made watertight. Caulking from outside using link-seal modular wall and casing seal. Secure sleeves against displacement.
  - D. On Grade Floor Sleeves:
    1. Same as below grade exterior wall sleeves, caulked from inside.
  - E. Exterior Wall Sleeves Above Grade:
    1. Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.
  - F. Layout work prior to concrete forming. Cut and patch as required. Reinforce sleeves to prevent collapse during forming and pouring.
  - G. Floor sleeves maintain a water barrier by providing a water tight seal or extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Sleeves through planters extend 8-inches above planter base.
  - H. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.
  - I. Special sleeves detailed on the Drawings take precedence over this section.
- 3.4 FLOOR, WALL AND CEILING PLATES
- A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.
  - B. Secure wall and ceiling plates to pipe or structure.
  - C. Plates not required in mechanical rooms or unfinished spaces.
- 3.5 CLEANING
- A. General:
    1. Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
  - B. Painted Surfaces:
    1. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- 3.6 EQUIPMENT PROTECTION
- A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.
  - B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
  - C. Cover or otherwise suitably protect equipment and materials stored on the job site.
- 3.7 ACCESSIBILITY
- A. General:

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1. Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
  - B. Gauges:
    1. Install gauges so as to be easily read from the floors, platforms, and walkways.
- 3.8 PAINTING
- A. General:
    1. Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
  - B. Equipment Rooms and Finished Areas:
    1. Hangers, Miscellaneous Iron Work, Structural Steel Stands, Tanks, Equipment Bases, Steel valve bodies and bonnets:
      - a. One coat of black enamel.
    2. Equipment:
      - a. One coat of red machinery enamel. Do not paint nameplates.
    3. Sprinkler Heads:
      - a. Not painted.
  - C. Concealed Spaces (above ceilings, not visible):
    1. Hangers, Miscellaneous Iron Work, Valve Bodies, and Bonnets: Not painted.
  - D. Sprinkler Piping:
    1. Concealed from View: Not painted.
    2. Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
    3. Exterior: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
    4. Alarm Bell: Factory paint with two coats of red enamel.
- 3.9 ADJUSTING AND CLEANING
- A. General:
    1. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
    2. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.
  - B. Piping:
    1. Clean interior of piping before installation.

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2. Flush sediment out of piping systems.

**3.10 ELECTRICAL EQUIPMENT**

- A. Do not install fire suppression systems in switchgear rooms, transformer vaults, telephone rooms, or electric closets except as indicated.
- B. Fire Suppression systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

**END OF SECTION**

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**SECTION 21 10 00**

**WATER BASED FIRE SUPPRESSION SYSTEMS**

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**PART 1 GENERAL**

**1.1 SUMMARY**

A. This Section includes Design-Build work and the following:

1. Double Detector Check Assembly
2. Reduced Pressure Detector Assembly
3. Electric Alarm Bell
4. Fire Department Connection
5. Wet Standpipe Hose Valve
6. Standpipe Hose Valve Cabinet
7. Sprinkler Heads
8. Flow Switch
9. Tamper Switch
10. Fire Department Test Station
11. Valves
12. Air Vent
13. Ductile Iron Water Pipe
14. Black Steel Pipe
15. Flanged Joints
16. Mechanical Pipe Couplings and Fittings
17. Threaded Fittings
18. Pressure Gauges
19. Utility Markers
20. Valve Identification
21. Piping Markers
22. Equipment Identification

**1.2 RELATED SECTIONS**

1. Division 21 05 00 Common Work Results for Fire Suppression

**1.3 QUALITY ASSURANCE**

- A. Provide a complete automatic fire sprinkler/combination standpipe system.
1. Grooved joint couplings, fittings, valves, and specialties products of a single manufacturer. Grooving tools of the same manufacturer as the grooved components.
  2. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.
- B. Regulatory Requirements:
1. Sprinkler system to comply with NFPA 13 and local Fire Marshal requirements.

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2. Refer to Section 21 05 00, Common Work Results for Fire Suppression for additional requirements.
- C. Hydraulically Calculated Sprinkler System: Sprinkler system to be hydraulically calculated grid system designed to provide:
  1. Light Hazard Occupancies: 0.10 GPM/Ft<sup>2</sup> density at most remote 1500 SF for public areas, living spaces, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements or additional excess pressure as required by fire marshal.
- D. NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal or owner's insurance underwriter requirements are more stringent. Exceptions must be approved by the Engineer prior to usage.
- E. Water Service Pressure Basis of Design:
  1. Coordination was done to determine fire service water pressure used to develop the fire sprinkler system design information included herein.
  2. Obtain updated flow test information prior to starting their design of the fire sprinkler system.

1.4 SUBMITTALS

- A. Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.
- B. Sprinklers referred to on shop drawings and identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

**PART 2 PRODUCTS**

2.1 SUMMARY

- A. This part provides accepted manufacturers and a description of relevant equipment used for a water based fire suppression system.
- B. Provide only new, first grade standard, current products of a manufacturer regularly engaged in the production of such materials and equipment. Where two or more pieces of equipment performing the same function are required, provide from same manufacturer.

2.2 MANUFACTURERS

- A. Detector Double Check:
  1. Ames
  2. Apollo/Conbraco
  3. Febco
  4. Watts
  5. Wilkins
  6. Or as approved for use in the local jurisdiction and University of Southern California (USC) approval.
  7. Other Manufacturers: Submit substitution request.
- B. Reduced Pressure Detector Assembly:
  1. Ames

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2. Apollo/Conbraco
  3. Febco
  4. Watts
  5. Wilkins
  6. Or as approved for use in the local jurisdiction and University of Southern California (USC) approval.
  7. Other Manufacturers: Submit substitution request.
- C. Electric Alarm Bell:
1. Edwards Signaling
  2. Potter Electric Signal Company
- D. Fire Department Connection:
1. Flush Type:
    - a. Elkhart
    - b. Potter-Roemer
  2. Siamese Double Clapper
    - a. Elkhart
    - b. FPPI
    - c. Potter-Roemer
- E. Standpipe Hose Valve:
1. Elkhart
  2. FPPI
  3. Potter-Roemer
  4. Reliable
- F. Standpipe Hose Valve Cabinet
1. Potter-Roemer
- G. Sprinkler Heads:
1. Globe
  2. Reliable Automatic Sprinkler
  3. Tyco Fire Protection Products
  4. Victaulic
  5. Viking
- H. Flow Switch:
1. Potter Electric
- I. Tamper Switch:
1. Potter Electric Signal Company
- J. Fire Department Test Station:
1. AGF
  2. Victaulic
- K. Valves:

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1. Where only one manufacturer's model is listed, equivalent products by those specified below, or equal, are acceptable upon approval.
  2. Use only one manufacturer.
  3. Gate:
    - a. Kennedy
    - b. Tyco Fire Products; TJP series, TJR series Models
    - c. Victaulic; 771, 772, 773 Model Series
    - d. Wilkins
    - e. Zurn
  4. Swing Check:
    - a. Kennedy; 1126, 1126A, 726 Models
    - b. NIBCO; G-997, W-403-W
    - c. Tyco Fire Products; CV-1F Model
    - d. Victaulic; 717 or 717H Model
    - e. Zurn/Wilkins; F210 Model
  5. Butterfly:
    - a. FPPI
    - b. Kennedy
    - c. Tyco Fire Protection Products
    - d. Victaulic
    - e. Zurn
  6. Specialty:
    - a. Conbraco
    - b. Kennedy
    - c. NIBCO
    - d. Victaulic
- L. Air Vents
1. ECS
  2. Potter
  3. Reliable Automatic Sprinkler
  4. Tyco Fire Protection Products
- M. Ductile Iron Water Pipe:
1. American
  2. McWane
  3. US Pipe
- N. Black Steel Pipe:
1. Bull Moose
  2. Wheatland
  3. Youngstown

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- O. Flanged Joints:
    - 1. American
    - 2. Anvil
    - 3. McWane
    - 4. US Pipe
  - P. Mechanical Pipe Couplings and Fittings:
    - 1. Tyco Fire Protection Products/Grinnell
    - 2. Victaulic
  - Q. Mechanical Tee (allowed on renovation projects only)
    - 1. Tyco Fire Protection Products/Grinnell
    - 2. Victaulic
  - R. Threaded Fittings
    - 1. American
    - 2. Anvil
    - 3. Tyco Fire Protection Products
    - 4. Viking
  - S. Pressure Gauges:
    - 1. Ametek
    - 2. Ashcroft
    - 3. FPPI
    - 4. Potter Roemer
    - 5. Reliable
    - 6. Victaulic
    - 7. Viking
    - 8. Winters Instruments
  - T. Heat Trace Cable (Freeze Protection):
    - 1. Chromalox
    - 2. Raychem
    - 3. Other Manufacturers: Submit substitution request.
  - U. Utility Markers:
    - 1. Brady Identoline
    - 2. Seton
  - V. Piping Markers:
    - 1. Marking Systems, Inc. (MSI).
    - 2. Seton
    - 3. W.H. Brady
- 2.3 DOUBLE CHECK DETECTOR ASSEMBLY
- A. 3-inch through 10-inch size with 3/4-inch bypass line, OS and Y type of shutoff valve with an auxiliary bypass line with an installed water meter. Main line check valve



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body and cover cast iron epoxy coated internally. Bypass line check valve body and cover bronze and check valve trim bronze, and four test cocks. UL listed and FM approved.

**2.4 REDUCED PRESSURE DETECTOR ASSEMBLY**

- A. 3-inch through 10-inch size with 3/4-inch bypass line, OS and Y type of shutoff valve with an auxiliary bypass line with an installed water meter. Main line check valve body and cover ductile iron epoxy coated internally, bronze main valve trim, bronze differential relief valve with stainless steel 316 trim and four test cocks. UL Listed or FM Approved.
- B. Maximum working pressure of 150 psi unless scheduled.

**2.5 ELECTRIC ALARM BELL**

- A. 10-inch diameter, 24VDC , 1-phase, red finish, UL listed or FM approved, labeled Fire Alarm.

**2.6 FIRE DEPARTMENT CONNECTION (FDC)**

- A. Description:
  - 1. Provide in accordance with California Fire Code and NFPA 13 and 14, Standard for Installation of Sprinkler Systems.
    - a. Install in an area accessible for the first response unit.
  - 2. Brass body with an integral clapper assembly to separate flow between inlets.
  - 3. UL listed or FM approved for fire protection use.
  - 4. At low point near each fire department connection, provide a 90-degree elbow with drain connection to allow for localized system drainage to prevent freezing.
- B. Siamese : Rough brass Siamese fire department inlet connection with clappers, 4-inch by 2-1/2-inch by 2-1/2-inch complete with plugs and chains with Storz connection, to include sign lettered Auto. Spkr.

**2.7 STANDPIPE HOSE VALVE**

- A. [2-1/2-inch by 2-1/2-inch] female x male hose valve with 1-1/2-inch reducer, cap and chain.

**2.8 STANDPIPE HOSE VALVE CABINET**

- A. 20-gauge steel box and frame in stainless steel, with glass door indicating "Fire Department Valve".
- B. Standpipe hose valves cabinets shall be fire rated where required.

**2.9 SPRINKLER HEADS**

- A. General:
  - 1. Provide one manufacturer throughout building. Mixing of sprinkler brands is not permitted.
  - 2. Brass frame construction with a coated metal sealing button coated with Teflon film. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
  - 3. Quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F

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4. Standard spray and extended coverage to not be mixed within a space or compartment.
5. UL listed or FM approved for working water pressures up to 175 psi. Sprinkler heads in dry and preaction type systems installed per NFPA 13.
6. Heads, UL or FM approved for application and installation.
- B. Provide intermediate or high temperature heads for mechanical rooms, areas below skylights, dishwashing and other areas which have high heat producing equipment to prevent accidental trippage per NFPA requirements.
- C. Sprinklers Installed in Finished Ceilings:
  1. Quick response, recessed, bulb type, **chrome** finish, 165 degrees F unless required otherwise.
- D. Sprinklers Installed in Finished Ceilings:
  1. Quick response, concealed pendent with **chrome** drop-off cover plate, 155 degrees F unless required otherwise.
- E. Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required):
  1. Pendent or upright , rough bronze finish, and adequate temperature for the hazard.
- F. Sprinklers Installed in Exterior Perimeter Areas:
  1. Quick response, horizontal dry sidewall sprinkler, polished chrome finish.
- G. Sprinklers Installed in Exterior Covered Areas:
  1. Quick response, dry pendent , chrome finish, 165 degrees F unless required otherwise.
- H. Life Safety Type Sprinkler Heads (Window Wash to Maintain Ratings at Glazed Openings at Enclosed Stairs):
  1. Quick response, chrome finish, horizontal sidewall or pendent vertical sidewall, Central Model WS Window Sprinkler, or similar listed sprinkler for this application.
- I. Sprinkler Heads, Corrosion Resistant:
  1. Pendent type, rough bronze finish, 165 degrees F, with factory applied corrosion resistant coating.
- J. Flexible Stainless Steel Hose:
  1. UL listed, or FM approved stainless steel hose assembly for individual sprinkler connections.
  2. Drop includes a UL approved braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces.
  3. Provide union joints for ease of installation.
  4. Attach flexible drop to the ceiling grid using a one-piece open gate bracket. The bracket allows installation before the ceiling tile is in place.
  5. The braided drop system is UL listed and FM approved for sprinkler services to 175 psi.

2.10 FLOW SWITCH

- A. Description:

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1. UL listed or FM approved electric flow switch with retard.
  2. Provide required accessories.
  - B. Single pole type with normally open and normally closed contacts. Location as shown. Provide rewired related trimmings. Provide one set of contacts for use by the Fire Alarm Contractor. Coordinate with pipe size.
- 2.11 TAMPER SWITCH
- A. Description:
    1. Each sprinkler system control valve equipped with a tamper switch listed by Underwriters Laboratories for the particular location and type of valve supervised.
    2. Initiates a supervisory signal upon a maximum of two complete turns of a valve wheel or closure of ten percent, whichever is less.
    3. Provide number of poles to coordinate with the fire alarm system manufacturer.
- 2.12 FIRE DEPARTMENT TEST STATION
- A. One piece, compact, floor test module for standard alarm test loop, threaded.
- 2.13 VALVES
- A. Gate, butterfly, and check valves must be UL listed or FM approved.
  - B. Bronze check valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
  - C. Full lug and grooved butterfly valves suitable for bi-directional dead end service at full rated pressure without use or need of a downstream flange.
  - D. Gate Valves: Rising stem or Non-rising stem with Post Indicator type.
  - E. Butterfly Valves: Extended necks.
  - F. Valve ends may be threaded, flanged, or grooved as applicable to piping system.
  - G. Provide ball drip drains, test orifices, and other related items as required to provide a complete fire protection system.
  - H. Gate Valves:
    1. Bronze Gate: Bronze body, bronze screwed bonnet, bronze solid wedge, OS&Y pattern, rising stem, pre-grooved stem for supervisory switch mounting, 175 psi, UL listed or FM approved.
    2. Iron Gate: Iron body, OS&Y pattern, solid wedge, pre-grooved stem for supervisory switch mounting, 175 psi, UL listed or FM approved.
    3. Iron Gate, High Pressure: Iron body, OS&Y pattern, solid wedge, FM approved for 300 psi, UL listed 350 psi.
    4. Upright Post Indicating Valve Assembly: Non-rising stem Gate Valve and Post Indicator to be of same brand.
      - a. Non-rising Stem Gate Valve: Iron body, non-rising stem, solid wedge, 175 psi UL listed or FM approved.
      - b. Post-Indicator: Iron body, red epoxy, polycarbonate window, UL listed or FM approved.
  - I. Check Valves:

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1. Horizontal Bronze Swing Check:
    - a. Bronze body, bronze-mounted, 175 psi.
    - b. Y-pattern, regrindable seat
    - c. Similar to Nibco KT-403-W
    - d. UL listed or FM approved.
  2. Horizontal Bronze Swing Check, High Pressure:
    - a. Bronze body, bronze-mounted, regrinding bronze disc, 365 psi.
    - b. UL listed or FM approved.
  3. Swing Check:
    - a. Iron body, 175 psi
    - b. Can be installed vertically upward flow or horizontally
      - 1) Flanged valves may be horizontal only.
    - c. Non-slamming operation
    - d. Similar to Victaulic 717
    - e. UL listed or FM approved
  4. Swing Check, High Pressure:
    - a. Iron body, 300 psi
    - b. Can be installed vertically for upward flow or horizontally
    - c. Non-slamming operation
    - d. Similar to Victaulic 717H
    - e. UL listed or FM approved
- J. Butterfly Valves:
1. Iron Butterfly:
    - a. Ductile iron body, aluminum-bronze disc and one-piece stainless steel shaft, copper bushing, fasteners and pins not used to attach stem to disc, gear operator, stem neck length to accommodate insulation where applicable, EPDM liner or disc, 200 psi;).
    - b. Butterfly valves in main riser path, FM approved.
  2. Iron Butterfly, High Pressure: Ductile iron body, ductile iron disc and one-piece stainless steel shaft, copper bushings, fasteners and pins not used to attach stem to disc, with lever handle and locking feature on valves 6-inches and smaller, gear operator, EPDM liner or disc, 300 psi, integral supervisory switch, UL listed or FM approved.
- K. Specialty Valves:
1. Drain Valves: Bronze ball valve, garden hose end, cap and chain 3/4-inch size, bronze cast body, chrome-plated full port ball, with handle, Teflon seat, threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing, 600 psi CWP; NIBCO T-585-70-HC.
  2. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4-inch; Conbraco 41 series, or equal.

2.14 AUTOMATIC AIR VENT (MECHANICAL)

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- A. The fire sprinkler contractor shall furnish and install an approved automatic air vent; 175 psi rated working pressure. Install per manufacturer's instructions.
  - B. Provide at least one automatic air vent per automatic fire sprinkler system.
  - C. Install automatic air vent at or near the remote high point of the fire protection system piping. Device location shall be at the location(s) provided on the drawings.
  - D. The piping between fire protection system and automatic air vent must not create a water trap; the connecting piping must drain when fire protection system is drained or automatic air vent cannot perform venting functions.
  - E. The fire sprinkler contractor shall leave the isolation ball valve in the open position after installation of the automatic air vent and the final testing of the system has been completed.
  - F. The automatic air vent shall have redundant float valves to prevent leakage from the device in the event that the primary float valve fails; the automatic air vent shall not require plumbing to drain.
  - G. The automatic air vent shall not require a drip pan or water collection device to prevent water discharge in the event that the primary float valve fails.
  - H. The automatic air vent shall have a pressure indicating element indicating functionality of the primary float valve that is visible from the floor or below the device. The contractor shall install the automatic air vent in a location that provides a clear view of the pressure indicating element.
  - I. Provide a supervised automatic air vent when automatic monitoring is specified.
- 2.15 DUCTILE IRON WATER PIPE
- A. Pipe: Ductile iron pipe conforming to ANSI A21.51.
  - B. Fittings:
    - 1. Below grade, Class 150 Boltite mechanical joint type complete with gaskets, bolts, and nuts, or Tyton for joints employing a single gasket for the joint seal with bell-and-spigot pipe.
    - 2. Above grade, mechanical couplings and fittings as specified herein.
    - 3. Provide interior pipe coating per ANSI Regulation listed.
  - C. Service: Below grade incoming fire protection main.
- 2.16 BLACK STEEL PIPE
- A. General:
    - 1. UL listed and FM approved for fire protection use.
    - 2. Fittings and joints must be UL listed with pipe chosen for use.
    - 3. Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.
    - 4. Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A795 for dry pipe sprinkler systems if air filled.
  - B. Pipe: ANSI/ASTM A53.
    - 1. Fire Protection:
      - a. Schedule 10 or Schedule 40 in sizes up to 5 inches.
      - b. 0.134-inch wall thickness for 6-inch.

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- c. 0.188-inch wall thickness for 8-inch and 10-inch.
- d. 0.330-inch wall thickness for 12-inch.
- C. Grooved Fittings: Roll grooved ends with mechanical couplings as specified.
- D. Threaded Fittings: Threaded ends with fittings as specified.
- E. Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

**2.17 FLANGED JOINTS**

- A. Flanged Joints:
  - 1. Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.
  - 2. Pressure rating and drilling matches the apparatus, valve, or fitting to which they are attached.
  - 3. Flanges in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psi; 300 pounds for system pressures 150 psi to 400 psi.
  - 4. Gaskets 1/16-inch thick, Cranite, or equal, ring type, coated with graphite and oil to facilitate making a tight joint.
  - 5. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psi; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psi to 400 psi. Use length of bolt required for full nut engagement.
  - 6. Provide electro-cad plated bolts and nuts.

**2.18 MECHANICAL PIPE COUPLINGS AND FITTINGS**

- A. Couplings and Fittings:
  - 1. Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.
  - 2. Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005. Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
  - 3. Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183.

**2.19 THREADED FITTINGS**

- A. Ductile iron conforming to ASME B16.3. Threads to be NPT per ANSI/ASME B1.20.1. Similar to Tyco Fire Protection Products Series 800.
- B. UL listed and FM approved.

**2.20 PRESSURE GAUGES**

- A. Description: 3-1/2-inch dial, turret case.
- B. Range:

SYSTEM	PRESSURE	GRADUATIONS

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Wet	0-300 psi	5 psi
Dry	0-80 psi	2 psi
*Provide compound gauge where shown on inlet side of fire pump on open piping systems (30-inch 15 psi). Other ranges may be listed on Drawings in which case they take precedence.		

2.21 UTILITY MARKERS

- A. Provide plastic tape utility markers over buried piping. Provide identification on tape.
- B. Material to be Brady Identoline plastic tape, 6-inch, Seton, or as approved.

2.22 VALVE IDENTIFICATION

A. Valve Tags:

1. General:

- a. Identify valves with metal tags or plastic signs, legends to be stamped or embossed.
- b. Indicate the function of the valve and its normal operating position, and area served; i.e.

3RD FL	(Area Served)
ISOLATION	(Valve Function)
NO	(Normal Operation Position)

- 2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
- 3. Material: Use 0.050 or 0.064-inch brass tags.
- 4. Control Valves:
  - a. Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicaid, or equal.
  - b. Form letters by exposing center ply.

B. Valve Tag Directory: Include the following:

- 1. Tag Number
- 2. Location
- 3. Exposed or Concealed
- 4. Area Served
- 5. Valve Size
- 6. Valve Manufacturer
- 7. Valve Model Number
- 8. Normal Operating Position of Valve

2.23 PIPING MARKERS

- A. Label pipes with all-vinyl, self-sticking labels or letters.
- B. Pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters.
- C. Identify and color code as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED

2.24 EQUIPMENT IDENTIFICATION

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- A. Nameplates:
  - 1. Tag pumps, and miscellaneous equipment with engraved nameplates.
  - 2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black.
  - 3. Form letters by exposing center ply.
  - 4. Identify unit with code number as shown on Drawings and area served.
- B. Equipment Nameplate Directory:
  - 1. List pumps, compressors and other equipment nameplates.
  - 2. Include Owner and Contractor furnished equipment.
  - 3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

**PART 3 EXECUTION**

3.1 SUMMARY

- A. This part provides directions on installation of water based fire suppression systems.

3.2 INSTALLATION

- A. General:
  - 1. Provide seismic hangers as required by code.
  - 2. Provide tamper switches on sprinkler system isolation valves. Provide flow switches for sprinkler zones. See Drawings for locations.
  - 3. A corrosion-resistant metal placard provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
  - 4. Install fire sprinklers in exhaust ductwork from grease hood per NFPA 13. Provide access doors for sprinkler access per NFPA 96 and IBC. Provide access doors at a maximum of 10-feet on center in horizontal run.
  - 5. Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
  - 6. Quick response sprinklers listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.
  - 7. All fire sprinkler system components shall be installed free of rust/corrosion or visible damage. All items not complying with this requirement shall be replaced without cost to the Owner.
  - 8. Provide an air vent at the high point of all of the fire protection systems as required by code and per the manufacture.
- B. Flexible Sprinkler Wet Head Drop:
  - 1. Install per manufacturer's installation requirements.
  - 2. Coordinate head location with other trades to assure space is available to maintain proper radius requirements.
  - 3. Provide flexible sprinkler drops of appropriate length as conditions require.
  - 4. Provide flexible sprinkler drops at sprinkler heads located in suspended, dropped, or acoustical ceilings. In hard lid ceiling areas, provide flexible heads at Contractor's option.



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- C. Sprinklers at Glazed Openings:
  - 1. Where noted on Drawings, Glazed opening will be protected on both sides of glass by listed quick response Life Safety Type sprinkler heads designated to wet entire surface of glass. Sprinklers spaced 6-feet apart, 8- to 12-inches from the glass, or as required per sprinkler manufacturer's listed installation instructions.
- D. Sprinklers above finished ceilings: Include heads above finished ceilings if structure is combustible, or if steel beams are not provided with spray-on fire proofing.
- E. Electrical: Electrical work to comply with Division 26, Electrical.
- F. Fire Service: Connect to sprinkler line where it enters the building.
- G. Standpipe hose connections:
  - 1. Provide in locations indicated and as required by code.
  - 2. Confirm with the code official for hose connections that are at their discretion.
  - 3. Coordinate exact installation location of with the architect and code official.
- H. Hangers and Supports:
  - 1. Install sprinkler system hangers, and supports in accordance with NFPA 13.
  - 2. Install standpipe piping, hangers, and supports in accordance with NFPA 14.
  - 3. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- I. Pressure Gauges:
  - 1. Provide gauges where specified, shown on Drawings, or required by code.
  - 2. Install additional gauges as required and as recommended by equipment manufacturer or their representative.
  - 3. Locate gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area.
  - 4. Install instruments over 6-1/2-feet above floor, to be viewed from the floor, with face at 30 degrees to horizontal.
  - 5. Provide instrument gauge cock at inlets.
- J. Valves:
  - 1. Provide valves at connections to equipment where shown or required for equipment isolation.
  - 2. Install valves accessible and same size as connected piping.
  - 3. Provide separate support for valves where necessary.
  - 4. Provide drain valves in low points in the piping system, and at equipment, as required by code, and as indicated.
  - 5. Fire Suppression Service:
    - a. In piping 2-inches and smaller; bronze gate valve, bronze swing check valve, vertical check valve.
    - b. In piping 2-1/2-inches and larger; iron gate valve, iron swing check valve, vertical check valve.
    - c. UL listed and FM approved butterfly valves.
    - d. Non-slamming check valves on pump discharge.

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6. Provide gauge cocks for pressure gauges.
- K. Piping Preparation:
1. Measurements, Lines and Levels:
    - a. Check dimension at the building site and establish lines and levels for work specified in this Section.
    - b. Establish inverts, slopes, and elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
    - c. Use established grid and area lines for locating trenches in relation to building and boundaries.
- L. Excavation and Backfill:
1. General:
    - a. Perform necessary excavation and backfill required for the installation of fire suppression work in accord with Division 02, Existing Conditions.
    - b. Repair pipelines or other work damaged during excavation and backfilling.
  2. Excavation:
    - a. Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps.
    - b. Include additional excavation to facilitate utility crossovers, additional offsets, etc.
    - c. Excavation material is unclassified.
    - d. Width of trench adequate for proper installation of piping. Widen if not wide enough for a proper installation.
  3. Bedding:
    - a. Cast iron, steel, and copper piping fully bedded on sand.
    - b. Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose.
    - c. Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length.
    - d. Lay other piping on a smooth level trench bottom so that contact is made for its entire length.
  4. Backfill:
    - a. Place in layers not exceeding 8 inches deep and compact to 95 percent of standard proctor maximum density at optimum moisture content. Earth backfill free of rocks over 2 inches in diameter and foreign matter. Disposal of excess material as directed.
    - b. Interior: Backfill under interior slabs bank sand or pea gravel.
    - c. Exterior:
      - 1) Excavated material may be used outside of buildings
      - 2) First 4-inches of sand and final 12-inch layer of course soil.

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**M. Piping:**

1. Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
2. Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
3. Provide test tees as required.
4. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
5. No fittings that bite into the pipe may be used.
6. Mechanical Couplings:
  - a. On systems using galvanized pipe and fittings, galvanize fittings at factory.
  - b. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
  - c. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
7. Install piping as to drain per NFPA 13.
8. Support piping independently at apparatus so that its weight not carried by the equipment.
9. Utility Marking:
  - a. Installed over the entire length of the underground piping utilities. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12-inches above the top of utility.
10. Underground Water System:
  - a. Prior to testing pipe provide concrete thrust blocks at changes in direction.
  - b. Block size as required for types of fittings involved.

**N. Drain Piping:**

1. Pitch drain piping 1/2-inch per 10-feet minimum; no traps allowed.
2. Discharge drain piping to outside with suitable splash plate to a location as approved by the architect.

**O. Piping Joints:**

1. Join pipe and fittings using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
2. Grooved Joints:
  - a. Install in accordance with the manufacturer's latest published installation instructions.

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- b. Clean pipe ends free from indentations, projections and roll marks in the area from pipe end to (and including) groove.
  - c. Gasket manufactured by the coupling manufacturer and verified as suitable for the intended service.
  - d. Factory trained representative (direct employee) of the coupling manufacturer to provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation.
  - e. Periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed.
  - f. Remove and replace any improperly installed products.
3. No couplings installed in floor or wall sleeves.
4. Steel Piping:
- a. Screwed Joints:
    - 1) Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
    - 2) Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare.
    - 3) Joints tightened so that not more than two threads are left showing.
    - 4) Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
  - b. Flanged Joints:
    - 1) Pressure rating of flanges match valve or fitting joined.
    - 2) Coat joint gaskets with graphite and oil.
5. Welded Joints:
- a. Preparation for Welding: Bevel piping on both ends before welding:
    - 1) Use following weld spacing on buttwelds:
 

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2
    - 2) Before welding, remove corrosion products and foreign material from surfaces.
  - b. Welded Joints:
    - 1) Use arc-welding process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for turns, use welding tees for tees. Use reducing fittings for size reduction. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
  - c. Welding Operation:

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- 1) After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
  - 2) Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.
  - 3) Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.
6. Ductile Iron Pipe: Install joints per manufacturer's written instructions.
- P. Pipe Wrap:
1. Apply per manufacturer's written instructions.
  2. Apply wrapping to fittings in field after installation.
- 3.3 IDENTIFICATION
- A. Valve Identification:
1. Valve Tags:
    - a. Attach to valve with a brass chain.
    - b. Valve tag numbers continuous throughout the building for each system. Obtain a list for each system involved from the Owner.
  2. Valve Tag Directory:
    - a. Include final copy in Operation and Maintenance Manual.
- B. Piping Markers:
1. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
    - a. Every 20-feet along continuous exposed lines.
    - b. Every 10-feet along continuous concealed lines.
    - c. Adjacent to each valve and stub out for future.
    - d. Where pipe passes through a wall, into and out of concealed spaces.
    - e. On each riser.
    - f. On each leg of a T.
    - g. Locate conspicuously where visible.
  2. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.
- C. Equipment Identification:
1. Nameplates:

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- a. Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.
- 2. Nameplate Directory:
  - a. Post final copy in Operation and Maintenance Manual.
- 3.4 EXTRA STOCK
  - A. Provide additional number of heads of each type and temperature rating installed as required to meet NFPA 13 requirements.
  - B. Provide storage cabinet or cabinets as required to receive reserve sprinkler heads and special installation tools required.
  - C. Provide index label for each head indicating manufacturer, model, orifice size of K-factor, and temperature rating.
  - D. Provide, inside cabinet a list of heads stored within and brief description of where installed.
  - E. Locate cabinet near sprinkler control station as approved.
- 3.5 FIELD QUALITY CONTROL
  - A. Tests and Inspections:
    - 1. Perform tests and arrange for required inspections of installed system as required.
    - 2. Notify the Architect 48 hours prior to any test or inspection.
    - 3. Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.
  - B. Inspection Service:
    - 1. At start of warranty year, execute inspection agreement.
    - 2. Without additional charge to Owner, make quarterly inspection of system during year.
      - a. Check and operate control valves.
      - b. Lubricate valve parts.
  - C. Report each inspection to Owner.

**END OF SECTION**

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**SECTION 22 05 00**

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**COMMON WORK RESULTS FOR PLUMBING**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of This Section, Common Work Results for Plumbing, apply to all sections in Division 22.
- C. All Sections of Division 22 are interrelated. When interpreting any direction, material, and method specified in any section of Division 22 consider it within the entirety of Work in Division 22.

**1.2 SUMMARY**

- A. The intent of Division 22 Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22 and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.
- B. The Division 22 Specifications and the accompanying Drawings are complimentary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications shall supersede drawings in case of conflict.
- C. Imperative language is frequently used in Division 22 Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- D. The Drawings that accompany the Division 22 Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions shall be assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.

**1.3 RELATED WORK**

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- A. The General and Supplemental Conditions apply to this Division, including but not limited to:
  - 1. Drawings and specifications.
  - 2. Public ordinances, permits.
  - 3. Include payments and fees required by governing authorities for work of this Division.
- B. Division 1, General Requirements, applies to this Division.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. General: All work and materials shall conform to the local and State codes, and all Federal, State and other applicable laws and regulations.
  - 2. Contractor responsible for obtaining and payment for all permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
- B. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects and in conformance with the Contract Documents.
- C. Apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.
- D. The entire plumbing system and apparatus shall operate at full capacity without objectionable noise or vibration.
- E. All equipment shall be installed level and true. Housekeeping pads and curbs shall account for floor or roof slope.
- F. Materials and Equipment:
  - 1. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.
  - 2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
  - 3. Furnish all materials and equipment of size, make, type, and quality herein specified.
  - 4. Equipment scheduled by performance or model number shall be considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for all changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.
- G. Workmanship:
  - 1. General: All materials shall be installed in a neat and professional manner.



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2. Manufacturer's Instructions: Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 22 Specifications, obtain clarification before starting work.

H. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction shall be made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Beams or columns shall not be pierced without permission of Architect and then only as directed.
5. All new or existing work cut or damaged shall be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished, and left in condition existing prior to commencement of work.

1.5 SUBMITTALS

A. Shop Drawings:

1. The Contract Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of all piping, and equipment installations. Shop Drawings shall be new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. All drawings shall be same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings. All drawings shall be fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Shop drawings shall be prepared in two dimensional format.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. In general, submit product data for review on all scheduled pieces of equipment, on all equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data sheets shall include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.

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4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.
- C. Submission Requirements:
1. Shop Drawings and Product Data:
    - a. Refer to Division 1 for additional requirements related to submittals.
    - b. Submit electronic copies of shop drawings and product data for Work of Division 22 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.
    - c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
    - d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, shall be included with the original submittal. Controls and Instrumentation submittals may lag but shall be complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder shall include a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.
- D. Contractor Responsibilities: It shall be the Contractor's responsibility to:
1. See that all submittals are submitted at one time and are in proper order.
  2. Ensure that all equipment will fit in the space provided.
  3. Assure that all deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.
- 1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS
- A. Refer to Division 1 for additional requirements.
  - B. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions shall cover all phases of control.
  - C. Furnish competent engineer knowledgeable in this building system for minimum of five 8-hour days to instruct Owner in operation and maintenance of systems and equipment. Contractor shall keep a log of this instruction including dates, times, subjects, and those present and shall present such log when requested by Architect.
- 1.7 PROJECT CONDITIONS
- A. Existing Conditions: Prior to bidding, verify and become familiar with all existing conditions by visiting the site, and include all factors which may affect the execution of this Work. Include all related costs in the initial bid proposal.
  - B. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

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- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City and Utility Company.

1.8 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

1.9 PROVISIONS FOR LARGE EQUIPMENT

- A. Contractor shall make provisions for the necessary openings in building to allow for admittance of all equipment.

1.10 TEST REPORTS AND CERTIFICATES

- A. Contractor shall submit one copy of all test reports and certificates specified herein to the Architect.

1.11 SUBSTITUTIONS

- A. Contractor shall submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

**PART 2 - PRODUCTS**

2.1 ACCESS PANELS

- A. Furnish under this Division as specified in another Division of work.

2.2 PIPE SLEEVES

- A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.
- B. Interior Wall and Floor Sleeves (fire rated): Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves: Cast iron.
- D. On Grade Floor Sleeves: Same as exterior wall sleeves.

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- E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.3 FLOOR, WALL AND CEILING PLATES

- A. Furnish stamped split type plates as follows:
  - 1. Floor Plates: Cast brass, chromium plated.
  - 2. Wall and Ceiling Plates: Spun aluminum.

2.4 ELECTRICAL EQUIPMENT

- A. General: All equipment and installed work shall be as specified under Division 26, Electrical.
- B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.
- C. Motors:
  - 1. Motors shall be furnished as integral part of driven equipment. They shall be drip-proof induction type with ball bearings unless noted otherwise. Motors 1 HP and above shall be premium energy efficient type, except for emergency equipment motors. Motors shall be built to NEMA Standards for the service intended. The motors shall be rated for the voltage specified, suitable for operation within the range of 10% above to 10% below the specified voltage.
  - 2. Energy efficient motors shall be Baldor, Westinghouse, General Electric or approved equal.
  - 3. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage and phase.
  - 4. Refer to individual product sections for additional motor requirements.
  - 5. Motors shall have built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors shall have quick trip devices.
  - 6. Motors located in environment air plenums not tied to air handling functions shall be totally enclosed type motors.
- D. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.
- E. Equipment Wiring: Interconnecting wiring within or on a piece of mechanical equipment shall be provided with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- F. Control Wiring: All control wiring for plumbing equipment shall be provided herewith.
- G. Codes: All electrical equipment and products shall bear the Underwriters label as required by governing codes and ordinances.

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**PART 3 - EXECUTION**

**3.1 ACCESS PANELS**

- A. Install in accord with manufacturer's recommendations, coordinated with architectural features.
- B. Provide 2-hour fire rated doors where required bearing the U.L. label.
- C. Furnish 18x18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12x12-inch for walls unless indicated otherwise.
- D. Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

**3.2 SLEEVES**

- A. Interior Floor and Wall Sleeves: Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork. Where pipe or ductwork is insulated, insulation shall pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve. Penetrations through mechanical room and fan room floors shall be made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.
- B. Sleeves Through Rated Floors and Walls: Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves Below Grade: Provide water tight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal. Contractor shall be responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.
- D. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.
- E. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.
- F. Layout work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
- G. All floor sleeves shall maintain a water barrier by providing a water tight seal or they shall extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves shall extend 2 inches above finished floor level. Sleeves through roof shall extend 8 inches above roof. Wall sleeves shall be flush with face of wall unless otherwise indicated. Waste stacks using carriers shall have sleeves flush with floor and sealed. Sleeves through planters shall extend 8 inches above planter base.

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- H. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members shall be provided so pipes are floor supported.
- I. Special sleeves detailed on drawings shall take precedence over this section.

**3.3 CLEANING**

- A. General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

**3.4 EQUIPMENT PROTECTION**

- A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.
- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

**3.5 ACCESSIBILITY**

- A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms and walkways.

**3.6 FLOOR, WALL AND CEILING PLATES**

- A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates shall completely cover opening around pipe.
- B. Secure wall and ceiling plates to pipe, insulation, or structure.
- C. Plates shall not penetrate insulation vapor barriers.
- D. Plates not required in mechanical rooms or unfinished spaces.

**3.7 PAINTING**

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- A. General: Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting. All exposed work under this division shall receive either a factory painted finish or a field prime coat finish, except:
  - 1. Exposed copper piping.
  - 2. Aluminum jacketed outdoor insulated piping.
- B. Equipment Rooms and Finished Areas:
  - 1. Insulation: Not painted.
  - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
  - 3. Steel Valve Bodies and Bonnets: One coat of black enamel.
  - 4. Brass Valve Bodies: Not painted.
  - 5. Equipment: One coat of grey machinery enamel. Do not paint nameplates.
- C. Concealed Spaces (above ceilings, not visible):
  - 1. Insulation: Not painted.
  - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.
- D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.
- E. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes shall comply with ANSI A13.1.

**3.8 ADJUSTING AND CLEANING**

- A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
- B. Use particular care in lubricating bearings to avoid damage by over lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

**3.9 ELECTRICAL EQUIPMENT**

- A. Piping for plumbing systems not serving electrical space shall not be installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.
- B. Piping for plumbing systems shall not pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

**3.10 EQUIPMENT CONNECTIONS**

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- A. Make final connections to equipment specified in sections other than Division 22 of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.
  
- B. Piping:
  - 1. Connections shall include hot and cold water, deionized water, distilled water, natural gas, medical gases, medical air and vacuum, dental air and vacuum, lab air and vacuum, sanitary waste and vent, lab waste and vent and fuel oil.
  - 2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
  - 3. All piping connections shall be independently supported to prevent undue strain on equipment.

**END OF SECTION**



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**SECTION 22 05 18**

**PLUMBING EXPANSION COMPENSATION**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

**1.2 SUMMARY**

- A. This Section includes: Expansion joints and compensation.
- B. Related Sections include:
  - 1. Section 22 0529 Hangers, Supports and Anchors for Plumbing.
  - 2. Section 22 0548 Vibration and Seismic Controls for Plumbing Piping and Equipment
  - 3. Section 22 2113 Pipe and Pipe Fittings Plumbing.

**1.3 QUALITY ASSURANCE**

- A. The expansion joints, pipe guides, and related supports, braces, and anchorages to building structure shall be designed to absorb thermal expansion and contraction of piping and terminal movement, as well as resist the static and dynamic loads due to fluid flow at design conditions, hydraulic testing pressures, and seismic forces.
- B. The system of expansion joints, guides, and related supports, braces, and anchorage to building structure shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
- C. Use expansion joints in straight lengths of rigid pipe; preferably welded steel, anchored and guided in accordance with best practices recommendations of Crocker and King, Piping Handbook, latest edition.
- D. Avoid use of expansion joints in conjunction with U-bends or other piping systems with "inherent" flexibility, such as Victaulic piping with flexible couplings. If expansion joints are used in piping with bends, thorough analysis of pipe stresses and deflections shall be conducted and extra care and attention shall be paid to radial thrust capacity of pipe guides, braces, and anchors.
- E. Design shall include:
  - 1. Pipe stress analysis indicating loads, deflections, and pipe stress at critical points throughout the piping systems under the following conditions:
    - a. At hydraulic design test pressure and ambient water temperature.

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- b. At design operating temperature, pressure, and flow.
  - c. Model number, size, location, and details of expansion joints, compensator guides, supports, braces, and anchorage to building structure, with substantiating calculations that the components and building can accept the calculated loads and deflections.
  - d. Detailed shop drawings stamped and signed by a registered professional engineer.
  - e. Structural details and calculations stamped and signed by a registered professional structural engineer.
- F. Expansion Joints to be designed and manufactured to the current Expansion Joint Manufacturers Association (EJMA) standards. Manufacturer of expansion joints to be certified by EJMA.
- 1.4 SUBMITTALS
- A. Submit the following:
- 1. Product data.
  - 2. Shop Drawings showing details of construction, dimensions, arrangement of components, and isolation.
  - 3. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
  - 4. Specified testing requirements.
  - 5. Operating and maintenance data.

**PART 2 - PRODUCTS**

2.1 EXPANSION JOINTS AND COMPENSATORS

- A. Acceptable Manufacturers:
- 1. Flexonics, Keflex, Hyspan, Metraflex.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description:
- 1. Expansion compensators to be of the packless, externally pressurized type to allow for axial movement constructed of stainless steel bellows, stainless steel shroud, integral guide rings, internal liner, limit stops, with drain port and plug.
  - 2. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

2.2 DWV EXPANSION JOINTS

- A. Acceptable Manufacturers:
- 1. Canplas, Fernco.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Expansion Joint:
- 1. DWV piston or sphere expansion/compression joint suitable for use with non-pressurized DWV piping.

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2. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

**2.3 EXPANSION LOOPS / SEISMIC EXPANSION JOINTS**

- A. Acceptable Manufacturers:
  1. Metraflex Metraloop.
  2. Other Manufacturers: Submit Substitution Request.
- B. Description:
  1. Flexible stainless steel hose and braid connector. .
  2. Connector shall accept differential support displacement without damaging pipe, equipment connections, or support connections.
  3. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

**2.2 PIPE GUIDES**

- a. Acceptable Manufacturers: Hyspan, Grinnell, Flexonics, Adscos, Pipe Shields Inc., Unistrut, or equal.
- b. Spider Clamp Assembly: Heavy gauge pressed steel, fusion welded, bolted construction, black enamel finish. Hyspan series 9500, or equal.

**PART 3 - EXECUTION**

**3.1 EXPANSION JOINTS AND COMPENSATORS**

- A. Install in all piping risers in wood structures to compensate for 1/2" of shrinkage per floor. Contractor is responsible to determine quantities and locations required.
- B. Install in piping to compensate for thermal expansion and contraction. Contractor is responsible to determine quantities and locations required.
- C. Install in other locations indicated on the drawings.
- D. Provide and install pipe alignment guides as recommended by the expansion joint manufacturer with the first guide no more than 4 pipe diameters away from the expansion joint or compensator and second guide no more than 14 pipe diameters from first guide.
- E. Install per manufacturer's installation instructions.

**3.2 EXPANSION LOOPS / SEISMIC EXPANSION JOINTS**

- A. Install at building seismic expansion joints.
- B. Install in piping to compensate for thermal expansion and contraction. Contractor is responsible to determine quantities and locations required.
- C. Install in other locations indicated on the drawings.
- D. Install per manufacturer's installation instructions.

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**END OF SECTION**

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**SECTION 22 0519**

**METERS AND GAUGES FOR PLUMBING**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Thermometers, pressure gauges, water meters, water flow meters, vacuum gauges.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Products listed in this section.
  - 2. Water flow meters, include graph of output signal vs. gpm for each device.
  - 3. Operating and Maintenance Data.

**PART 2 - PRODUCTS**

2.1 WATER METER

- A. Acceptable Manufacturers:
  - 1. Neptune
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Magnetic drive, low torque registration; high resolution, low flow leak detection; bayonet-style register mount for in-line serviceability; tamperproof seal pin; corrosion-resistant, lead free, high-copper alloy maincase.

2.2 THERMOMETERS, WATER

- A. Acceptable Manufacturers:
  - 1. Ashcroft, Weiss, Trerice, Marsh, Weksler, Tel-Tru.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Direct drive 5-inch dial type, stainless steel case, separable sockets, stem length to penetrate minimum of 1/2 pipe diameter, adjustable face, extension necks where required to clear insulation.

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C. Range:

<b>Plumbing Systems</b>	<b>Temperature °F</b>	<b>Graduations (°F)</b>
Domestic Cold Water	25-125	1
Domestic Hot Water	30-180	2

**2.3 PRESSURE GAUGES - GENERAL**

A. Acceptable Manufacturers:

1. Marsh, Ashcroft, Weiss, Trerice, Weksler, Tel-Tru.
2. Other Manufacturers: Submit Substitution Request.

B. Description: 4-1/2-inch dial, molded black polypropylene turret case.

C. Range:

<b>Plumbing Systems</b>	<b>Pressure (psi)</b>	<b>Graduations (psi)</b>
Domestic Cold Water	0-160	1
Domestic Hot Water	0-160	1
Other ranges may be listed on Drawings in which case they take precedence		

**PART 3 - EXECUTION**

**3.1 INSTALLATION - GENERAL**

- A. Provide meters and gauges where shown on Drawings.
- B. Install all gauges and meters as required and as recommended by equipment manufacturer or their representative.
- C. Extend all connections, wells, cocks, or gauges to a minimum of 1-inch beyond insulation thickness of the various systems.
- D. Locate all gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area, i.e., platform, catwalk, etc.
- E. Install instruments over 6'-6" above floor, to be viewed from the floor, with face at 30 degrees to horizontal.

**3.2 INSTALLATION - PRESSURE GAUGES**

- A. Provide instrument gauge cock at inlets. Locate pressure gauge taps for measuring pressure drop or increase across pumps, etc., as close to the device as possible.

**END OF SECTION**

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**SECTION 22 05 23**

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**GENERAL DUTY VALVES AND SPECIALTIES FOR PLUMBING**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

**1.2 SUMMARY**

- A. This Section includes: Valves, general purpose gauge cocks, and balance fittings.

**1.3 SUBMITTALS**

- A. Submit product data.

**1.4 DEFINITIONS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. PTFE: Polytetrafluoroethylene plastic.
- H. Lead Free: Refers to the wetted surface of pipe, fittings, and fixtures in potable water systems that have a weighted average lead content  $\leq 0.25\%$  per Safe Drinking Water Act as amended January 4<sup>th</sup> 2011. Section 1417 \*Add specific state requirements as needed.

**1.5 QUALITY ASSURANCE**

- A. ASME Compliance:
  - 1. ASME B16.10 for ferrous valve dimensions.
  - 2. ASME B31.9 for building services piping valves.

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- B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 371 for valve materials for potable-water service. Valves for domestic water must be 3<sup>rd</sup> Party Certified.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURER VALVES**

- A. General: Where only NIBCO INC. figure numbers are listed, equivalent products by those specified below are acceptable.
1. Gate, Globe, Swing Check: Victaulic, Crane, Kennedy, Stockham, Milwaukee, Walworth and Hammond.
  2. Silent Check: Mueller, Metraflex, Victaulic, Bell and Gossett, Milwaukee and Gruvlok.
  3. Balancing: DeZurik, Homestead, Bell and Gossett, Armstrong, Walworth, Taco, Wheatley, Tour and Andersson, Victaulic, Gruvlok, and Nibco.
  4. Butterfly: Victaulic, Gruvlok, Crane, Walworth, Milwaukee and Metraflex.
  5. Ball: Gruvlok, Apollo, Crane, Hammond, Milwaukee and Victaulic.
  6. Medical Gas Valves: Hill Rom, Oxequip, Allied (Chemtron), Puritan Bennett, Medaes.
- B. Other Manufacturers: Submit Substitution Request.
- C. All such valves shall be of one manufacturer.
- D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 2113 for allowable fittings.

**2.2 GLOBE VALVES**

- A. Bronze Globe and Angle Globe: Bronze body, bronze mounted, renewable composition disc, 150 psi rating; Nibco 235 or 335.
- B. Bronze Globe and Angle Globe High Pressure: Bronze body, stainless steel disc, union bonnet, 300 psi steam; Nibco 276-AP or 376-AP.

**2.3 CHECK VALVES**

- A. Horizontal Bronze Swing Check: Bronze body, bronze mounted, regrinding bronze disc, 150 psi steam rating, 300 psi WOG; Nibco 433-Y.
- B. Lead Free Horizontal Bronze Swing Check: Lead Free Silicon Bronze corrosion resistant body, and trim, PTFE renewable seat and disc, 300 psi CWP; NIBCO S/T 413-Y-LF.
- C. Horizontal Iron Swing Check: Iron body, bronze mounted, regrinding bronze disc and seat ring, 125 psi rating; Nibco 918.



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- D. Lead Free Horizontal Iron Swing Check: ASTM A 126 gray Iron body, Stainless steel or Lead Free silicon bronze corrosion resistant trim, 200 CWP psi rating; NIBCO F-918-LF.

**2.4 BALL VALVES**

- A. Bronze Ball: Bronze cast body, chrome-plated full port ball, with handle, Teflon seat, 600 psi WOG, 150 psi steam; Nibco 585-80.
- B. Lead Free Bronze Ball: Two piece, full port, Lead Free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF.
- C. Bronze Ball, Clean Service: Bronze body, union fittings, bronze ball, self-cleaning, Buna-N ball seats 400 psi WOG factory cleaned, capped and bagged for oxygen service in accordance with CGA4.1 (Cleaning equipment for oxygen service) & NFPA 99, Ohmeda 207 series.

**2.5 BUTTERFLY VALVES**

- A. Ductile iron body, nickel chrome plated disc and stainless steel shaft, with lever handle and locking feature on valves 6-inches and less, gear operator on valves 8-inches and over; stem neck length to accommodate insulation where applicable, EPDM liner, 200 psi water; Nibco 2000, Nibco 4765.
- B. Lead Free Butterfly Valve: Ductile iron body, Lead Free Aluminum Bronzedisc and stainless steel stem, with lever handle and locking feature on valves 6-inches and less, gear operator on valves 8-inches and over; stem neck length to accommodate insulation where applicable, EPDM liner, 200 psi water; NIBCO LD- 2000N-3/5,
- C. Copper Grooved Piping System Butterfly Valve: Nylon coated or Cast bronze body per Copper Development Agency-836, ductile iron disc encapsulated with EPDM coating, lever handle up to 6-inches, gear operator on valves 8-inches and greater, stem length to accommodate insulation, 300 psi water; Victaulic Series 608, per ASTM A-584
  - 1. Grooved ends shall be manufactured to copper-tubing sizes. Flaring tube or fitting ends to accommodate alternate sized couplings is not permitted.

**2.6 BALANCING VALVE**

- A. Calibrated:
  - 1. Bronze, Ametal (copper-alloy), or ductile iron body, brass globe or ball, differential pressure readout valves with integral checks, calibrated plate, integral pointer, suitable for tight shutoff, memory stops, threaded, grooved or soldered ends, 250 psi water, Victaulic, Tour Anderson, Bell and Gossett CB.
  - 2. Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

**2.7 SPECIALTY VALVES**

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- A. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4 inch; Apollo 41 series.
- B. Drain Valves: Bronze globe valve or full port ball valve, garden hose end, cap and chain 3/4 inch size.

**2.8 SYSTEM SPECIALTIES**

- A. Manual Air Vents: Coin type; Dole No. 9 or approved equal.
- B. Pressure/Temperature Test Plug:
  - 1. Acceptable Manufacturers:
    - a. Peterson Engineering, Inc., Universal Lancaster, Sisco, Trerice.
    - b. Other Manufacturers: Submit Substitution Request.
  - 2. General: 1/2-inch N.P.T. fitting to receive either a temperature or pressure probe 1/8-inch O.D., fitted with a color coded and marked cap with gasket.
  - 3. Material: Solid brass with valve core of Nordel.
  - 4. Rating: Minimum 300 psig at 275°F.
  - 5. Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch O.D. probe and two five-inch stem pocket test thermometers 25°F to 125°F for chilled water, 40°F to 240°F for heating water.

**2.9 WATER RELIEF VALVES**

- A. Acceptable Manufacturers:
  - 1. Consolidated, Kunkle, B&G, Armstrong, Cash Acme.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description: Bronze or steel body, stainless steel or bronze, pressure settings to 160 psi at 250°F, conforming to Section IV of ASME Code, size per manufacturer's recommendations based on Code, setting as indicated; Kunkle Model 537.

**2.10 STRAINERS**

- A. Acceptable Manufacturers:
  - 1. Armstrong, McAlear, Sarco, Steamflo, Mueller, R.P. & C. Company Titan Flow Control.
  - 2. For Grooved Coupling Systems: Gruvlok or Victaulic.
  - 3. Other Manufacturers: Submit Substitution Request.
- B. Wye Pattern:
  - 1. Bronze: Bronze body, 250 psi, 1/16-inch perforated type 304 stainless screen.
  - 2. Ductile Iron: Ductile iron body, 300 psi, 1/16 or 1/8-inch 304 stainless steel screen.
  - 3. Cast Iron: Cast iron body, 125 psi, 1/16-inch perforated type 304 stainless screen.
  - 4. Cast Iron, High Pressure: Cast iron body, 250 psi, 1/16-inch perforated type 304 stainless screen.

**2.11 BACKWATER VALVE**

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- A. Acceptable Manufacturers:
  - 1. J.R. Smith, Zorn, Josam.
  - 2. Other Manufacturers: Submit Substitution Request.
  
- B. Description: J.R. Smith 7022Y cast iron backwater valve with threaded cover and no-hub connections. Model 7022S may be substituted for shallow bury applications where vault access is not required.

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Provide valves at connections to equipment where shown or required for equipment isolation.
- B. Provide separate support for valves where necessary.
- C. Provide drain valves in all low points in the piping system, at coils and equipment, and as indicated.

3.2 APPLIED LOCATIONS PLUMBING VALVES

- A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
<b>Domestic Hot</b>	Not Allowed	Bronze	Bronze	Bronze	Not Allowed
<b>Domestic Cold</b>	Not Allowed	Bronze	Bronze	Bronze	Not Allowed

- B. Calibrated balancing valves on domestic hot water.
- C. Silent check valves on pump discharge for domestic cold water.
- D. Check valves on vertical discharge of sump pumps and sewage ejector pumps, iron swing check with outside weight and lever. Mount in piping at 45 degree angle.
- E. Provide gauge cock for all pressure gauges.

3.3 VALVE IDENTIFICATION

- A. General: Identify valves to indicate their function and system served.
- B. See Section 22 0553, Identification for Plumbing Piping and Equipment.

3.4 CHAIN OPERATORS

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- A. All valves in equipment rooms or fan rooms used for equipment or coil isolation and more than 8 feet above floor shall be installed with stem horizontal and equipped with chain wheels and chains extending to 6 feet above floor.

**3.5 WATER PRESSURE REDUCING VALVE ASSEMBLY**

- A. Two valve assembly with smaller valve approximately 33 percent of the total larger valve approximately 66 percent of the total demand. See schedule on drawings for GPM flow rates and pressure settings of valves.

**3.6 INSTALLATION**

- A. Manual Air Vents:
  - 1. Install at all high points where automatic air vents are not used, where noted, and where required for proper venting of system.
  - 2. Install in accordance with manufacturer's recommendations.
- B. Grooved joints shall be installed in accordance with the manufacturer's published installation instructions. Gaskets shall be molded and produced by the coupling manufacturer and shall be suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the project site to ensure best practices in grooved installation are being followed. (A distributor's representative is not considered qualified to conduct the training of field visits.)
- C. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.
- D. Water Relief Valves:
  - 1. Install where indicated, and in accordance with manufacturer's instructions. Pipe discharge to nearest floor drain using Schedule 40 steel pipe.
- E. Strainer:
  - 1. Applied Locations Plumbing:
    - a. Bronze wye, in piping 2-inch and smaller; domestic water, solar hot water, reclaimed water, cold process water, process grey water.
    - b. Cast iron, in piping 2-1/2-inch and larger; solar hot water, reclaimed water, cold process water, process grey water
    - c. Cast iron, high pressure wye, in piping 2-1/2-inch and larger; domestic water.
- F. Backwater Valves:
  - 1. Install backwater within vault indicated. If vault not indicated (shallow bury application), provide soil pipe extension to install ferrule and cover at top and flush with floor surface.

END OF SECTION

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**SECTION 22 05 29**

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**HANGERS, SUPPORTS AND ANCHORS FOR PLUMBING**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Supports and anchors for piping systems and equipment.
- B. Related Sections include:
  - 1. Section 22 0548 Vibration and Seismic Controls for Plumbing Piping and Equipment.
  - 2. Section 22 0700 Insulation for Plumbing.
  - 3. Section 22 2113 Pipe and Pipe Fittings Plumbing.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Shop Drawings of contractor fabricated piping support structures.
  - 2. No other submittals required under this section.

**PART 2 - PRODUCTS**

2.1 SUPPORTS, ANCHORAGE AND RESTRAINT

- A. General: Provide pipe and equipment hangers and supports in accordance with the following:
  - 1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for piping are not shown on the Drawings, the contractor shall be responsible for their design.
  - 2. Seismic restraints and anchorages shall resist seismic forces as specified in the latest edition of the International Building Code and California Building Code for the seismic zone in which the project is constructed.
  - 3. Seismic restraint shall not introduce excessive stresses in the piping caused by thermal expansion or contraction.
  - 4. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

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5. Seismic restraints shall be in accordance with the latest edition of the SMACNA "Seismic Restraint Manual - Guidelines for Mechanical Systems" for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
  6. Seismic restraints shall be in accordance with the applicable code.
  7. Seismic restraints shall follow the provisions described in Section 22 0548 Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B. Engineered Support Systems: The following support systems shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
1. Supports and seismic restraints for suspended piping and equipment.
  2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
  3. Equipment and piping support frame anchorage to supporting slab or structure.

## 2.2 SUPPORTS, GENERAL

- A. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.
- B. Acceptable Manufacturers: Unistrut, Superstrut, Powerstrut and Kinline, B-Line Systems, AnvilStrut.
- C. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
- D. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.
- E. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

## 2.3 PIPE ATTACHMENTS

- A. Acceptable Manufacturers: Anvil as noted or equivalent products by Superstrut, B-Line Systems, Tolco, Michigan Hanger.
- B. Uninsulated Horizontal Copper Piping:
1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
  2. Larger than 2-inch: Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods. Electricians' tape is unacceptable.
- C. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.
- D. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:
1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
  2. Larger than 2-inch: Anvil 260.
- E. Other Uninsulated Horizontal Pipe:

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1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
  2. Larger than 2-inch: Anvil 260.
- F. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
  2. Larger than 2-inch: Anvil 260.
- G. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
  2. Larger than 2-inch: Anvil 260.
- H. Riser Clamps Copper Pipe:
1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
- I. Riser Clamps Other Piping: Anvil 261.
- 2.4 PIPE ROLLERS, INSULATION PROTECTION SHIELDS AND INSULATION PROTECTION SADDLES
- A. Acceptable Manufacturers: Anvil as noted or equivalent Super Strut, B-Line Systems, Tolco, Michigan Hangers.
- B. Pipe Rollers: Anvil 174 or 274 as required. Size for pipe plus insulation for insulated pipe.
- C. Insulation Protection Shields: Anvil 167.
- D. Insulation Protection Saddles: Anvil 160 through 166A as required. Saddles for copper pipe, factory or field copper plated.
- 2.5 BUILDING ATTACHMENTS
- A. Acceptable Manufacturers: Anvil as listed or equivalent products by Elcen, Superstrut, B-Line Systems, Tolco, Michigan Hangers.
- B. Beam Hangers:
1. On piping 6-inch and smaller: Anvil 86 with retaining clip Fig. 89.
- C. Inserts: Anvil 152 malleable iron or 281 steel inserts. Inserts sized for required rod to support load being carried.
- D. Expansion Plugs: Similar and equal to Phillips "red-head" self-drilling flush shell selected for safety factor of 4.
- E. Powder actuated fasteners with silencers as approved by Architect.

**PART 3 - EXECUTION**

3.1 HANGERS AND SUPPORTS

- A. General:

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1. Install all support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the Drawings.
  2. Provide adjustable hangers for all pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
  3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
  4. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
  5. Install all cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
  6. Support all piping within 2 feet of each change of direction on both sides of fitting.
- B. Insulated Piping Systems:
1. See Section 22 0700 for insulation requirements.
  2. Insulated Piping Systems with Vapor Barrier Insulation:
    - a. Install hangers outside of insulation.
    - b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
  3. Insulated Piping Systems with Non-Vapor Barrier Insulation:
    - a. As specified for Insulated Piping Systems with Vapor Barrier Insulation.
  4. Insulation Protection:
    - a. Band insulation protection shields firmly to insulation to prevent slippage.
    - b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.
- C. Vertical Piping:
1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
  2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
  3. Risers that are not subject to thermal change to be supported at each floor of penetration.
  4. Risers that are subject to thermal change require engineered supports. Size supports to carry all forces exerted by piping system when in operation. Riser supports shall follow the provisions described in Section 22 0548, Vibration and Seismic Controls for Plumbing Piping and Equipment.
- D. Horizontal Piping:
1. Trapeze Hangers: Multiple pipe runs where indicated shall be supported on channels with rust resistant finish. Provide all necessary rods and supporting steel.
  2. Support Spacing: Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
    - a. Support piping within 2 feet of each change in direction.
    - b. Steel Pipe, Copper Tubing:



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<b>Minimum Pipe Size</b>	<b>Max. Span Steel</b>	<b>Max. Span Copper</b>	<b>Rod Size</b>
1-inch and smaller	7 feet	5 feet	1/4-inch
1-1/4-inch to 2-inch	8 feet	8 feet	3/8-inch
2-1/2-inch to 3-inch	11 feet	9 feet	1/2-inch

- c. Plumbing Piping: Support in accordance with local plumbing code.
- d. Piping provided with acoustical lagging wrap shall be supported a maximum of 5 feet on center. Install hangers outside of acoustical lagging.

**E. Building Attachments:**

1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support all piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
2. Provide horizontal bracing on all horizontal runs 1-1/2 inch and larger and exceeding 50 feet in length at 75 foot intervals and as required to provide stabilized piping systems.
3. Provide all additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

**END OF SECTION**

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**SECTION 22 0548**

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**VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

**1.2 SUMMARY**

- A. This Section includes:
  - 1. Isolation of mechanical equipment as indicated on the Drawings and specified herein.
  - 2. Seismic restraint of equipment and piping.
- B. Related Sections include:
  - 1. Section 22 0529 Hangers, Supports and Anchors for Plumbing.

**1.3 QUALITY ASSURANCE**

- A. A single manufacturer shall select and furnish all isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this specification.
- B. Isolation performance requirements are indicated on the Drawings. All deflections indicated are nominal static deflections for specific equipment supported.
- C. Seismic snubbers, restrained isolator housings and cable system components shall have anchorage preapproval "OPA" number from OSHPD in the State of California verifying the maximum certified load ratings.
- D. Isolator Stability and Rated Capacity:
  - 1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
  - 2. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
- E. Seismic Restraints:
  - 1. Restraint of equipment and piping to be in accordance with the current state and local Building Code.
  - 2. All calculations shall be in accordance with current state and local Building Code.

**1.4 SUBMITTALS**

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- A. Submit the following:
  - 1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
    - a. Equipment mounting holes.
    - b. Dimensions.
    - c. Isolation selected for each support point.
    - d. Details of mounting brackets for isolator.
    - e. Weight distribution for each isolator.
    - f. Code number assigned to each isolator.
  - 2. Submit product data and calculation sheets for isolators, showing:
    - a. Size, type, load rating and rated deflection of each required isolator.
    - b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
- B. Installation report as specified in Part 3 of this section.
- C. Operation and maintenance data.

**1.5 EQUIPMENT VIBRATION ISOLATION**

- A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.
- B. Isolation work to include, but not necessarily be limited to, the following:
  - 1. Isolation support of motor-driven equipment.
  - 2. Inertia base frames in conjunction with isolation.
  - 3. Isolation support of piping and piping risers.
  - 4. Penetration isolation of pipework and conduits through walls, floors or ceilings.
  - 5. Flexible connections of piping to equipment.
- C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
  - 1. Rotating equipment operating peak vibration velocities must not exceed 0.08 in./sec.
  - 2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment shall be repaired or replaced at no expense to the owner until approval of the equipment is given by the engineer.
- D. Any components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment, shall be provided.

**1.6 ACCEPTABLE MANUFACTURERS**

- A. Amber Booth.
- B. Mason Industries, Inc.
- C. Kinetics Corporation.
- D. Vibrex.

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E. Approved equal, meeting all of the conditions and requirements specified herein.

**1.7 CONTRACTOR RESPONSIBILITY**

A. All vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single manufacturer or suppliers.

B. Adequately restrain all equipment and piping to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Design and applicable state and local codes.

C. In addition, the contractor shall have the following responsibilities:

1. Selection, installation, adjustment and performance of vibration isolators which will meet the requirements given on the plans or in the specifications.
2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

**PART 2 - PRODUCTS**

**2.1 TYPE 1 - NEOPRENE WAFFLE PAD**

A. 3/4-inch thick neoprene waffle pads with pattern repeating on 1/2-inch centers.

B. Select Duro rating for maximum deflection at average load rating.

C. Include load distribution steel plate as required.

D. Include anchor bolt grommet as required.

E. Acceptable Manufacturer: Mason Type "Super W" or "Super WM" and "HG Grommet"; Similar Amber-Booth, Kinetics Corporation.

**2.2 TYPE 2 - RESTRAINED NEOPRENE MOUNT**

A. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2-inches and all directional seismic capability.

B. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements.

C. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation.

D. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications.

E. Manufacturer: Mason type BR.

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**2.3 TYPE 3 - SPRINGS**

- A. Free standing springs without housings.
- B. 1/4-inch thick molded neoprene cup with steel reinforcement washer or neoprene acoustical friction pads between base plate and support.
- C. All mounting shall have leveling bolts with height saving brackets.
- D. Springs mounted outboard of channels.
- E. Attach baseplate screws using neoprene bushings and washers.
- F. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
- G. Manufacturer: Mason type SLF, Amber-Booth type SW, Kinetics Corporation, Vibrex.

**2.4 TYPE 4 - SPRINGS WITH RESTRAINTS**

- A. Same as springs except housing with seismic restraints to be added.
- B. Seismic restraint with molded all directional neoprene bushings an integral part of isolator.
- C. Seismic restraint selected for minimum safety factor of 2 from ultimate seismic capacity.
- D. Spring mount must have neoprene cup or pad inside the seismic housing to allow anchoring of the housing baseplate without short circuiting pad.
- E. Manufacturer: Mason type SLR or SLRS with seismic restraints; similar Amber-Booth, Kinetics Corporation Model FYS, Vibrex.

**2.5 TYPE 7 - ISOLATING SPRING HANGERS**

- A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.
- B. Isolators shall have the proper deflection to allow the piping to deflect as a unit with the pump isolators.
- C. Hangers designed for 30 degree angular movement.
- D. Minimum deflection shall be one inch.
- E. Manufacturer: Mason 30N, similar Amber-Booth, Consolidated Kinetics, Vibrex.

**2.6 TYPE 8 – ISOLATING NEOPRENE HANGERS**

- A. Double deflection neoprene hangers shall have a minimum static deflection of 0.35-inches.
- B. Provide projecting bushing to prevent steel to steel contact.

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C. Manufacturer: Mason HD, similar Amber-Booth, Consolidated Kinetics, Vibrex.

2.7 ISOLATING SLEEVES

A. Provided for all piping through walls and floors of penthouses and chiller room. Size for piping as required.

B. Manufacturers: Potter-Roemer PR isolators or Grinnell Semco Trisolators.

2.8 SEISMIC RESTRAINTS

A. General Requirements:

1. Seismic restraints shall be provided for all equipment and piping, both supported and suspended.
2. Bracing of piping shall be in accordance with the code and with the provisions set forth in the SMACNA seismic restraint manual.
3. The structural requirements for the restraints, including their attachment to the building structure, shall be reviewed and approved by the structural engineer.
4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:

1. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
2. Bushing shall be replaceable and a minimum of 1/4-inch thick. Rated loadings shall not exceed 1000 psi.
3. An air gap of 1/4-inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
4. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to ensure no short circuits exist before systems are activated.
5. Snubber shall be type Z-1225 as manufactured by Mason Industries, Inc.

C. Bracing of Pipes:

1. Provide seismic bracing of all piping as detailed below to meet the building code requirements:
  - a. Exception: Piping suspended by individual hanger's 12-inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced where the following criteria are met.
    - 1) Seismic braces are not required on high deformability piping when the  $I_p=1.0$  and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inches diameter or less.
    - 2) Seismic braces are not required on high deformability piping when the  $I_p=1.5$  and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.

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4. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12-inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints on unsupported sections of piping shall be braced or stabilized between floors.
5. Vertical risers shall be laterally supported with a riser clamp at each floor. For buildings greater than six stories high or for piping subject to thermal change all risers shall be engineered individually.

D. Suspended Equipment and Piping:

1. Seismic cable restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
3. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
4. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall be type SRC or UC as manufactured by Mason Industries, Inc.
5. Pipe clevis cross-bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

2.9 FLEXIBLE SPHERE CONNECTOR

- A. Flexible EPDM pipe connectors shall be manufactured of multiple plies of Kevlar tire cord fabric and EPDM; both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement.
- B. Connectors up to and including 2-inch diameter may have a single sphere and threaded ends. Connectors 2-1/2-inch and larger shall be manufactured with twin spheres up to 12-inches and a single sphere on larger sizes and floating steel flanges recessed to lock the connectors raised face EPDM flanges.
- C. All connectors shall be rated a minimum of 150 psi at 220°F. All connections shall be pre-extended as recommended by the manufacturer to prevent additional elongation under pressure.
- D. Mason type SFU, SFDEJ or SFEJ.

2.10 FLEXIBLE HOSE CONNECTOR

- A. Flexible stainless steel hoses shall be manufactured using type 304 stainless steel hose and braid with one fixed and one floating raised face carbon steel plate flange.

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- B. Sizes 2-1/2-inch (65mm) and smaller may have threaded male nipples or copper sweat ends. Grooved ends are acceptable in all sizes in grooved piping systems. Weld ends are not acceptable. Copper sweat end hoses for water service shall be all copper or bronze construction.
- C. Hose shall have close pitch annular corrugations for maximum flexibility and low stiffness. Tested hose stiffness at various pressures must be included in the submittals.
- D. Hose shall be capable of continuous operation at 150 psi and system test pressure when installed in piping systems.
- E. Hose shall be the same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required.
- F. Mason type BSS, FFL, MN, CPS or CPSB, similar HCl, Metraflex.

**2.11 EXPANSION JOINT/SEISMIC CONNECTOR**

- A. T304 stainless steel hose and braid, Schedule 40 radius elbows and 180 degree bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.
- B. Connector shall accept differential support displacement without damaging pipe, equipment connections, or support connections.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Do not install any equipment or pipe which makes rigid contact with the building. "Building" includes slabs, beams, studs, walls, etc.
- B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.
- C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

**3.2 PREPARATION**

- A. Treat all isolators, including springs, hardware and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.
- B. Coat steel frames exposed to weather with a rustproof metal primer.



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- C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

**3.3 INSTALLATION**

**A. General:**

1. The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.
2. Anchor isolator seismic housing baseplate to floor.
3. Rubber grommets and washers shall be provided to isolate the bolt from the building structure. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the building structure.

**3.4 SEISMIC RESTRAINTS**

**A. General:**

1. Install and adjust seismic restraints so that the equipment and piping support is not degraded by the restraints.
2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

**B. Supported Equipment:**

1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
2. Care must be taken so that the 1/4-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

**C. Bracing of Pipes:**

1. Branch lines may not be used to brace main lines.
2. Transverse bracing shall be at 40 feet maximum, except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes
3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity to resist both the seismic load and the additional force induced by expansion and contraction.
4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.

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6. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Suspended Equipment, Piping, Cable Method:

1. The cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers shall be adjusted so that there is a maximum 1/4-inch clearance.

3.5 FIELD QUALITY CONTROL

- A. Installation Report: Isolation manufacturer's representative shall confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

**END OF SECTION**

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**SECTION 22 0553**

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**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Identify valves, piping and equipment components of the mechanical systems to indicate their function and system served.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
  - 2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
  - 3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

**PART 2 - PRODUCTS**

2.1 VALVE IDENTIFICATION

- A. Valve Tags:
  - 1. General: Identify valves with metal tags, legends to be stamped or embossed. It shall indicate the function of the valve and its normal operating position; i.e.,  
56 HW (NUMBER AND CONTENTS OF PIPE)  
ISOLATION (VALVE FUNCTION)  
NO (NORMAL OPERATION POSITION)
  - 2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
  - 3. Material: Use 0.050 or 0.064-inch brass tags.
  - 4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, "lamicoid" or equal. Form letters by exposing center ply.
  - 5. Buildings Systems: Contact the Owner for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

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- B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

**2.2 PIPING MARKERS**

- A. Acceptable Manufacturers:
  - 1. W.H. Brady, Seton, Marking Systems, Inc. (MSI).
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Pipes shall be labeled with all-vinyl, self-sticking labels or letters. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters. The pipe markers shall be identified and color coded as follows with black directional arrows.

<b>PLUMBING SERVICE</b>	<b>BACKGROUND PIPE MARKER *</b>	<b>COLOR</b>
COLD WATER	"DOMESTIC COLD WATER"	GREEN
HOT WATER	"DOMESTIC HOT WATER SUPPLY"	YELLOW
	"DOM. HOT WATER RECIRC"	YELLOW OR GREEN
SANITARY WASTE	"SANITARY WASTE"	GREEN
STORM DRAIN	"STORM DRAIN"	GREEN
OVERFLOW DRAIN	"OVERFLOW DRAIN"	GREEN
VENT	"VENT"	GREEN

\* Directional arrow applied adjacent to pipe marker indicating direction of flow.

**2.3 EQUIPMENT IDENTIFICATION**

- A. Nameplates:
  - 1. Tag all pumps and plumbing equipment with engraved nameplates. Nameplates shall be 1/16-inch thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
  - 2. Identify unit with code number as shown on Drawings and area served.
- B. Equipment Nameplate Directory: List pumps, and other equipment nameplates. Include Owner and Contractor furnished equipment. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

**PART 3 - EXECUTION**

**3.1 VALVE IDENTIFICATION**

- A. Valve Tags:
  - 1. Attach to valve with a brass chain.

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2. Valve tag numbers shall be continuous throughout the building for each system. Contractor shall obtain a list for each system involved from the Owner.

B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

### 3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:

1. Every 20 feet along continuous exposed lines.
2. Every 10 feet along continuous concealed lines.
3. Adjacent to each valve and stubout for future.
4. Where pipe passes through a wall, into and out of concealed spaces.
5. On each riser.
6. On each leg of a "T".
7. Locate conspicuously where visible.
8. Provide pipe identification (over insulation) for all reclaimed water systems in accordance with current local codes and rulings.

B. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

C. Install tags on specialty gas piping valves with brass chain.

### 3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

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**SECTION 22 0590**

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**PRESSURE TESTING FOR PLUMBING SYSTEMS**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Pressure testing of piping systems.

1.3 QUALITY ASSURANCE

- A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.
- B. Owner Witness: Perform all tests in the presence of the Owner's representative.
- C. Engineer Witness: The Engineer or Engineer's representative reserves the right to observe all tests or selected tests to assure compliance with the specifications.
- D. Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's representative and the Engineer's representative need not occur simultaneously.

1.4 SUBMITTALS

- A. Submit the following:
  - 1. Test Reports:
    - a. Submit certificate of completion, inspection and test by authority having jurisdiction on required piping systems.
    - b. Submit certificate of test approval by Owner's representative on all systems.
    - c. The Engineer's representative will record witnessed tests.

**PART 2 - PRODUCTS – NOT APPLICABLE**

**PART 3 - EXECUTION**

3.1 GENERAL

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- A. Piping: Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties. Conduct tests with all valves but those used to isolate the test section 10% closed.
- B. Leaks: Repair all leaks and retest until stipulated results are achieved.
- C. Notification: Advise the Architect 72 hours in advance of each test. Failure to so notify will require test to be rescheduled.
- D. Testing Equipment: Provide all necessary pumps, gauges, connections and similar items required to perform the tests.

**3.2 TESTING REQUIREMENTS**

- A. Sanitary and Roof Drainage Systems: Test entire system or sections of system by closing all openings in piping except highest opening and filling system with water to point of overflow. If system is tested in sections, plug each opening except highest opening of section under test and fill each section with water, but none with less than 10-foot head of water. Keep water in system or in portions under test for at least 45 minutes before inspection starts. Test for two (2) hours with no drop allowed. Locate and repair leaks.
- B. Domestic Water Systems: Test per current State and local codes.

END OF SECTION

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**SECTION 22 07 00**

**INSULATION FOR PLUMBING**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Insulation for piping, and equipment.
- B. Related Sections include:
  - 1. Section 22 05 29 Hangers, Supports and Anchors for Plumbing.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723.
  - 2. Energy Codes: Local Building and Energy Codes shall govern where insulation performance requirements for thickness exceeds thickness specified.
- B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.
- C. Source Quality Control:
  - 1. Service: Use insulation specifically manufactured for service specified.
  - 2. Labeling: Insulation labeled or stamped with brand name and number.
  - 3. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, shall not react corrosively with equipment, piping, or ductwork, and shall be asbestos free.

1.4 SUBMITTALS

- A. Submit the following.
  - 1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS



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- A. Equivalent products by Johns Manville, Knauf, Owens Corning, and CertainTeed are acceptable.
- B. All such insulation shall be of one manufacturer.
- C. Other Manufacturers: Submit Substitution Request.

**2.2 PIPE INSULATION**

- A. Pre-formed mineral wool: Mineral wool insulation made from basalt, volcanic rock, and bound with thermosetting resin; ASTM C447; ASTM C547; ASTM C585; ASTM C795; ASTM E84; ASTM C1335; ASTM C1338; UL 723. Johns Manville MINWOOL-1200 or equal.

**2.3 PIPE ACOUSTICAL WRAP**

- A. Barrier shall be constructed of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side. The barrier shall have a nominal density of 1 lb per square foot and minimum STC rating of 28. The barrier shall have a minimum thermal conductivity value of 0.29 and a rated service temperature range of -40°F to 220°F. Barrier shall have a flame spread index of no more than 10 and a smoke development index of less than 40.
- B. Kinectics Noise Control model KNM-100ALQ.

**2.4 BLOCK INSULATION**

- A. Fiberglass: 1-1/2-inch thick unless specified or shown otherwise with 3 pcf nominal density, 0.23 per inch maximum K-factor at 75°F mean temperature and 450°F minimum operating temperature limit. Johns Manville 1000 Series.

**2.5 ACCESSORIES PIPING**

- A. Adhesives:
  - 1. Mineral Wool: Zeston Z-Glu.
- B. Cements:
  - 1. Insulating: Ryder.
  - 2. Heat Transfer: Zeston Z-20.
- C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
- D. Pipe Fitting Covers: One piece aluminum pipe fitting covers.
- E. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.
- F. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150°F. Zeston Z-tape.

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**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Workmanship:
  - 1. Installation: Insulation installed in first class, neat professional manner.
  - 2. Applicators: Applicators shall be employed by firm that specializes in insulation work.
- B. Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.
- C. Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

**3.2 PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS**

- A. Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
<b>Domestic Cold Water, Above Grade</b>	1 1/4-inch and smaller	Mineral wool, metal jacket	1-inch	Note 1
	Above 1 1/4-inch	Mineral wool, metal jacket	1 1/2-inch	Note 1
<b>Domestic Hot Water Supply/Return, Above Grade</b>	1 1/2-inch and smaller	Mineral wool, metal jacket	1 1/2-inch	Note 1
	Above 1 1/2-inch	Mineral wool, metal jacket	2-inch	Note 1
<b>Traps and trap priming lines (In unheated Spaces)</b>	All	Mineral wool, metal jacket	1-inch	
<b>Irrigation Piping, Inside Building</b>	All	Mineral wool, metal jacket	1/2-inch	
<b>Condensate or other cold water drains</b>	All	Mineral wool, metal jacket	1/2-inch	
Note 1: Cover with metal pipe jacket where exposed to weather.				
Note 2: Drain bodies, insulate the first 10 feet connected to the drain body, and all horizontal piping. Do not insulate main vertical stack.				

- B. The following piping is not insulated:
  - 1. Waste and vent
  - 2. Domestic cold water runouts to single fixture less than 12-inch long and exposed supplies.
- C. Insulation shall include all fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, piping through sleeves, except valve bonnets, unions and flanges need not be insulated on the following systems: Domestic hot water, inside building.

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- D. Valves and irregular fittings shall be insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive. The contractor shall have the option on all flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge S.S. lacing wire.
- E. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

### 3.3 PIPING INSTALLATION

- A. General:
  - 1. Joints: Coat both sides of complete joining area with applicable adhesive.
    - a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
    - b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
    - c. Multiple Layered Insulation: Joints staggered.
  - 2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
  - 3. Voids: Fill all voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
  - 4. Seal joints, seams and fittings of metal watertight jackets at exterior locations.
- B. Mineral Wool Insulation: Exterior insulation encased in metal jacket.
- C. Fittings: Insulation specified with continuous vapor barrier; the vapor barrier must not be violated.
  - 1. Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.
- D. Unions, Mechanical Joints, Valves, Etc.:
  - 1. General:
    - a. As specified for fittings.
    - b. Minimum thickness same as specified for piping.
  - 2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
  - 3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
  - 4. Flanged Valves: Insulation with square corners.
- E. Vapor Barrier Insulation:
  - 1. Refer to Section 22 0529 for support requirements.
  - 2. Piping which requires vapor barrier protection shall have a continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
    - a. Domestic cold water.
    - b. All other piping systems with a nominal operating temperature below 65°F.
  - 3. Vapor Barrier Insulation:

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- a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
- b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29.

F. Non-Vapor Barrier Insulation:

- 1. Refer to Section 22 0529 for support requirements.
- 2. For pipe 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
- 3. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation. Provide pipe shield specified in Section 22 05 29.

G. Acoustical Wrap:

- 1. Install in accordance with the manufacturer's instructions.
- 2. Applied locations for piping systems:
  - a. Where specified or indicated on drawings.

3.4 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces shall conform to curves of surface.

- 1. Access: Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance shall be provided with covers or section that are easily removable and replaceable. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
- 2. Voids, Depressions and Cavities: All voids, chipped corners and other openings shall be filled with insulating cement or material compatible with insulating material.
- 3. Vapor Barriered Insulation: Where insulation is specified to have a vapor barrier, the barrier shall not be pierced or broken.
  - a. Tears, etc., shall be coated with vapor barrier mastic and patched with insulation facing or tape.
  - b. Staples brush coated with vapor barrier coating.
  - c. All raw edges coated with vapor barrier mastic shall be covered and cover shall be sealed to equipment surface.
- 4. Non-Vapor Barriered Insulation:
  - a. Tears, etc., shall be patched with insulation facing or tape.
  - b. All raw edges shall be covered and neatly beveled to the equipment surface.
- 5. Multilayered Insulation: With staggered joints.

B. Fiberglass Block:

- 1. Anchors: Lug nuts 10 gauge black annealed iron wire welded to metal surfaces.
- 2. Banding: Block secured to surface with 1/2-inch wide stainless steel bands maximum 18-inches on center and secured to anchors.
- 3. Insulating Cement: Block covered with insulating cement minimum thickness of 1/2-inch with smooth finish.
- 4. Vapor Barriered System: On vapor barriered system, apply continuous coat of vapor barrier mastic.

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- 5. Finish: Finish with cloth facing secured with adhesive and lapped a minimum of 2 inches. Defects touched up with finishing cement.
  
  - C. Expansion Joints: Covered with larger size pipe insulation to allow full movement and be removable, ends turned back to pipe, coat with vapor barrier mastic on joints in vapor barriered system and finished with cloth facing cemented to insulation with adhesive.
- 3.5 FIELD QUALITY CONTROL
- A. Field Test: All systems shall be tested and approved prior to installation of insulation.

END OF SECTION

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**SECTION 22 2113**

**PIPE AND PIPE FITTINGS PLUMBING**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

**1.2 SUMMARY**

- A. This Section includes: Furnish piping, pipe fittings, and incidental related items as required for complete piping systems.
- B. Related Sections Include:
  - 1. Section 22 2500 Plumbing Water Treatment.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
  - 2. Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.
- B. All grooved joint couplings and fittings shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.
- C. Pipe Cleaning: Should any pipe be plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.
- D. Correct any damage to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

**1.4 SUBMITTALS**

- A. Submit the Following:
  - 1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
  - 2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.

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- B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.
- C. Other: Make certified welders' certificates available.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. As indicated.

**2.2 CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)**

- A. General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.
- B. Pipe and Fittings: Service weight hubless cast iron conforming to ASTM A 74, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International. Tyler, AB&I, or Charlotte.
- C. Gaskets: Compression type conforming to ASTM C 564.
- D. Couplings:
  - 1. Above Grade: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.
  - 2. Buried: Husky 28 gauge 304 stainless steel hubless type clamp and orange corrugated shield assemblies (80-inch pound torque) with neoprene sealing gaskets (ASTM-C-564), or Clamp-All (125-inch pound torque), 24 gauge 304 stainless steel hubless type clamp, and shield assemblies with neoprene sealing gaskets (ASTM-C-564).
- E. Service:
  - 1. Sanitary, storm, and overflow drain.
  - 2. Vent piping 2 inches and above.

**2.3 CAST IRON SOIL PIPE, SERVICE WEIGHT (HUB AND SPIGOT)**

- A. General: Code approved hub and spigot pipe and fitting system conforming to ASTM A74 marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
- B. Gaskets: Compression type gaskets conforming to ASTM C564.
- C. Service:
  - 1. Below Grade: Sanitary waste, storm and overflow drain.

**2.4 GALVANIZED STEEL PIPE**

- A. Pipe: Schedule 40 conforming to ASTM A 135 or A 53.

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- B. Fittings: 150 lb. screwed galvanized malleable iron on 2-inch and below, Victaulic, Gruvlok, Gustin-Bacon, or Mech Line full flow galvanized, grooved end on 2-1/2-inch and above. Provide grooved type gasketed couplings and fittings for pipe 2-1/2-inch and above.
- C. Service:
  - 1. Miscellaneous indirect waste piping.
  - 2. At Contractor's option, waste and vent piping 1-1/2 inches and under, above grade.

**2.5 COPPER PIPE**

- A. Pipe: Hard drawn copper tubing, Class L or K, ASTM B 88.
- B. Fittings: Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal. At contractor's option, a system using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.
- C. Service:
  - 1. Domestic hot and cold water piping below ground (Type K, hard drawn) on piping 3 inches and smaller.
  - 2. Domestic hot and cold water piping above ground (Type L, hard drawn) on piping 4 inches and smaller.
  - 3. Trap priming lines (Type L, annealed).
  - 4. Pumped waste (DWV).
  - 5. Miscellaneous drains and overflows.

**2.6 PRESS FIT PIPE AND PIPE FITTINGS**

- A. Acceptable Manufacturers:
  - 1. Victaulic Vic-Press, Viega ProPress.
  - 2. Other manufacturers submit Substitution Request.
- B. Pipe: 1/2-inch to 2-inches nominal diameter.
  - 1. Type L Copper: Conforming to ASTM B-88.
- C. Couplings and Fittings:
  - 1. Couplings and fittings shall be produced from the same material as pipe by same manufacturer of pipe.
  - 2. Couplings precision cold drawn with self contained factory installed O-ring HNBR sealing element.
  - 3. Fittings used with pipe shall be fabricated from same material as pipe. Elbows on pumped systems to be long radius type.
- D. Service:
  - 1. Domestic hot and cold water piping above ground (Type L copper, hard drawn) on piping 2-inches and smaller.
  - 2. Trap priming lines (Type L copper, annealed).

**2.7 FLANGED JOINTS**



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- A. Flanged Joints: Flanges shall be cast iron or steel for screwed piping and forged steel welding neck for welded line sizes. Pressure rating and drilling shall match the apparatus, valve, or fitting to which they are attached. Flanges shall be in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psig; 300 lb. for system pressures 150 psig to 400 psig. Gaskets for all flanged services, except steam and pumped condensate, shall be Garlock 3700 or equal, 1/8-inch thick, non-metallic type. Gaskets for steam and pumped condensate shall be Flexitaulic Style CG or equal, 1/8-inch thick, semi-metallic type. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig. Use length of bolt required for full nut engagement. Provide electro-cad plated bolts and nuts on cold and chilled water lines.

**2.8 UNIONS**

- A. 150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.
1. Unions or flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as disconnect points.)
- B. Dielectric fittings shall be nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F-492. Fittings shall be suitable for the pressure and temperature to be encountered.

**2.9 SOLDER AND BRAZING**

- A. Brazed Joints:
1. Wrought Copper Piping Fittings: Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.
  2. Applied locations:
    - a. All below grade piping.
    - b. All above grade piping larger than 2-inches for the following services: Industrial cold water, domestic hot and cold water, and pumped waste.
    - c. Oxygen, nitrous oxide, carbon dioxide, medical vacuum, lab vacuum and lab air. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
    - d. Joints in Domestic Hot and Cold Water Piping: Use mechanically extracted collars. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.
    - e. Solar hot water.
- B. Soldered Joints:
1. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
  2. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
  3. Applied locations: Above grade piping 2-inch and smaller for the following services: domestic hot and cold water, trap priming lines.

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**2.10 UTILITY MARKERS**

- A. Provide plastic tape utility markers over all buried piping. Provide identification on tape.
- B. Material to be Brady Identoline plastic tape, 6-inch, Seton, or as approved.

**2.11 PIPE WRAPPING**

- A. For all below ground steel piping and fittings, provide complete covering of Scotchrap No. 51, 20 mil thickness, protective tape applied over Scotchrap pipe primer applied at 1 gal/800 SF of pipe surface.
- B. At Contractor's option as approved, pipe may be furnished with factory applied jacket of "X-tru-coat" with Scotchrap as previously specified for field joints.

**2.12 FLEXIBLE CONNECTOR**

- A. Expansion Joint/Seismic Connector:
  - 1. T304 stainless steel hose and braid, Schedule 40 radius elbows and 180° bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.
  - 2. Connector shall accept differential support displacement without damaging pipe, equipment connections, or support connections.
  - 3. In steel piping systems, three Victaulic flexible couplings may be used in lieu of a flexible connector for vibration attenuation and stress relief at equipment connections. The couplings shall be placed in close proximity to the vibration source.
- B. Service:
  - 1. Miscellaneous drains and overflows.
  - 2. Domestic hot and cold water piping.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Measurements, Lines and Levels:
  - 1. Check dimension at the building site and establish lines and levels for work specified in this Section.
  - 2. Establish all inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
  - 3. Use established grid and area lines for locating trenches in relation to building and boundaries.

**3.2 EXCAVATION AND BACKFILL**

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- A. General: Perform all necessary excavation and backfill required for the installation of mechanical work in accord with Division 2. Repair pipelines or other work damaged during excavation and backfilling.
- B. Excavation: Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps. Include additional excavation to facilitate utility crossovers, additional offsets, etc. Excavation material is unclassified. Width of trench shall be adequate for proper installation of piping. The trench shall be widened, if not wide enough for a proper installation.
- C. Bedding: All cast iron, steel, and copper piping shall be full bedded on sand. Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose. Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length. Lay all other piping on a smooth level trench bottom so that contact is made for its entire length.
- D. Backfill: Place in layers not exceeding 8 inches deep and compact to 95% of standard proctor maximum density at optimum moisture content. Earth backfill shall be free of rocks over 2 inches in diameter and foreign matter. Disposal of excess material as directed.
  - 1. Interior: All backfill under interior slabs shall be bank sand or pea gravel.
  - 2. Exterior: Excavated material may be used outside of buildings at the Contractor's option. The first 4 inches shall be sand, and final 12-inch layer course shall be soil in any event.

**3.3 PIPING INSTALLATION**

- A. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
- B. Mechanical Pipe Couplings and Fittings:
  - 1. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 2. Flexible couplings to be used only when expansion, contraction, deflection or noise and vibration is to be dampened, as detailed or specified.
  - 3. On systems using galvanized pipe and fittings, fittings shall be galvanized at factory.
  - 4. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
  - 5. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
  - 6. Gaskets shall be molded and produced by the coupling manufacturer, and shall be suitable for the intended service.
  - 7. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the project site to ensure best practices in grooved installation are being followed. (A distributor's representative is not considered qualified to conduct the training or field visits.)

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- C. Press Fit Systems:
    - 1. Pipe shall be square cut, deburred, cleaned, and properly marked to ensure non-leak O-ring seal in accordance with manufacturers specifications contained in latest published literature.
    - 2. Before assembly, check pipe ends and fittings for insertion mark. Lightly coat O-rings with approved lubricant.
    - 3. Assemble pipe couplings and fittings using only by approved Pressfit PFT-510 tool equipped with the proper size PressJaw in accordance with manufacturer. Fittings that connect with-out the use of a press tool are not acceptable.
    - 4. Stainless steel products should be handled only by non-contaminating apparatus.
  - D. Install all piping as to vent and drain. Install according to manufacturer's recommendations.
  - E. Support all piping independently at apparatus so that its weight shall not be carried by the equipment.
  - F. Run piping clear of tube cleaning or removal/replacement access area on heat exchangers, water heaters, etc.
  - G. Utility Marking: Installed over the entire length of the underground piping utilities. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12 inches above the top of utility.
  - H. Underground Water System: Prior to testing pipe provide concrete thrust blocks at changes in direction. Block size as required for types of fittings involved.
  - I. Dielectric Fittings: Provide dielectric couplings, unions, or flanges between dissimilar metals. In addition, provide dielectric couplings as required to isolate cathodically protected piping and equipment.
  - J. No-Hub Couplings: Install per manufacturer's instructions.
- 3.4 PIPING JOINTS

- A. Pipe and fittings shall be joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. shall be done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
- B. Copper Piping: Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished. Joint shall be uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.
- C. No couplings installed in floor or wall sleeves.
- D. Welded Joints:
  - 1. Preparation for Welding: Bevel piping on both ends before welding:
    - a. Use following weld spacing on all buttwelds:

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<b>Nominal Pipe Wall Thickness</b>	<b>Spacing</b>	<b>Bevel</b>
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

- b. Before welding, remove all corrosion products and foreign material from surfaces.
- 2. Welded Joints: Joints shall be made by the “arc-welding” process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for all turns, use welding tees for all tees. Reducing fittings must be used for size reduction. “Weldolets” may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
- 3. Welding Operation:
  - a. After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
  - b. Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld shall present professional appearance and be free of depressions below surface of jointed members.
  - c. No welding shall be done when temperature of base metal is lower than 0°F. Material to be welded during freezing temperatures shall be made warm and dry before welding is started. Metal shall be “warm to the hand” or approximately 60°F.

E. Flexible Connector: Provide where indicated on the Drawings.

**3.5 INSTALLATION, PIPE WRAP**

- A. Apply per manufacturer’s written instructions.
- B. Apply wrapping to fittings in field after installation.

**3.6 ADJUSTING AND CLEANING**

- A. General:
  - 1. Clean interior of all piping before installation.
  - 2. Flush sediment out of all piping systems after installation before connecting plumbing fixtures to the piping.
  - 3. When placing the water systems in service during construction, each system shall be cleaned by circulating a solution with 1000 ppm (1#20 gallon) of trisodium phosphate for 24 hours, then drained, flushed and placed in service.
  - 4. Clean all strainers prior to placing in service.

END OF SECTION

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**SECTION 22 2123**

**PUMPS FOR PLUMBING**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Variable speed circulator pump.

1.3 QUALITY ASSURANCE

- A. Select pump with a minimum efficiency as listed in schedule.

1.4 SUBMITTALS

- A. Submit the following:
  - 1. Product data for each pump including performance curves, pump efficiency, motor data, operating weights, and pressure ratings. Submit control information and wiring diagrams for packaged equipment.
  - 2. Operating and maintenance data for each product specified under this Section.

**PART 2 - PRODUCTS**

2.1 IN-LINE CIRCULATING PUMPS

- A. Acceptable Manufacturers:
  - 1. Grundfos.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description:
  - 1. Variable speed circulator, electronically controlled permanent magnet EC motor.
  - 2. Magnetite resistant design with a stainless-steel bearing plate, ceramic shaft, and ceramic bearing rings
  - 3. LED display with energy watt consumption and flow indicator in gallons per minute
  - 4. Three constant pressure control modes with push button settings
  - 5. Integrated check-valve and nut captures for flanges

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**PART 3 - EXECUTION**

3.1 IN-LINE CIRCULATING PUMP INSTALLATION

- A. Motor in horizontal or vertical depending on normal design of pump.
- B. Provide valves and specialties as detailed on Drawings.
- C. Lubricate in accordance with manufacturer's instructions before operation.
- D. Support and isolate circulators as specified and as scheduled on the Drawings.

**END OF SECTION**

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**SECTION 22 25 00**

**PLUMBING WATER TREATMENT**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Treatment of domestic water systems and solar hot water systems.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Shop drawings.
  - 2. Product data.
  - 3. Operating and maintenance data.
  - 4. Certificate of completion.
  - 5. Treatment Reports.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE CHEMICAL TREATMENT MANUFACTURER/SUPPLIER

- A. Mount Hood Chemical, Nalco, Mogul, Chemax, Chemcoa, DuBois Chemicals.
- B. Other Manufacturer/Suppliers: Submit Substitution Request.

2.2 PLUMBING WATER TREATMENT

- A. Domestic Water Chlorination:
  - 1. Chlorination shall be accomplished by personnel in employed of firm licensed to do this type of work.
  - 2. As a minimum, potable water systems shall be disinfected prior to use as outlined within the current state or local Plumbing Code or as prescribed by the Health Authority, whichever requirements are more stringent.
  - 3. Chemicals: Sodium Hypochlorite 12.5% EPA registered for drinking water application.



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**PART 3 - EXECUTION**

**3.1 INSTALLATION**

**A. Plumbing Domestic Water Systems:**

1. Provide 1/2-inch injection point on incoming water line immediately after the backflow device.
2. Flush system with fresh water to remove all dirt and construction debris.
3. Open all fixtures to develop slow rate of flow through system.
4. Inject Sodium Hypochlorite solution at a rate to achieve greater than 100ppm chlorine at all fixtures.
5. Flush entire system so no chlorine is present.
6. Bacteriological samples shall be submitted to a certified laboratory who shall certify that the water is suitable for drinking. The certificate stating purity of water shall be delivered to the Architect.

**3.2 FINAL ADJUSTMENT**

- A. When the systems are accepted by the Owner the chemical treatment supplier shall make final adjustments in the required concentrations.
- B. Submit report of indicating initials and final concentrations and system chemistry.

END OF SECTION

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**SECTION 22 30 00**

**PLUMBING EQUIPMENT**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing, apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes: Water heaters, domestic water expansion tanks, backflow preventers, utility vaults, oil/water separators, catch basin, heat trace, acid neutralization systems, pH monitoring system, fuel oil fill stations.
- B. Related Sections include:
  - 1. Section 22 4000 Plumbing Fixtures.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Water heaters to meet state energy code requirements.

1.4 SUBMITTALS

- A. Submit the following:
  - 1. Product data for each item specified.
  - 2. Operating and maintenance data.

**PART 2 - PRODUCTS**

2.1 WATER HEATERS

- A. Heat Pump Water Heater (Remote Storage):
  - 1. Acceptable Manufacturers:
    - a. Sanden
    - b. Other Manufacturers: Submit Substitution Request.
  - 2. Description:
    - a. R744 (CO2)
    - b. Heat Pump COP 5.2
    - c. Energy Star
    - d. Hot water production down to -20F
    - e. Min 170F hot water supply temp
    - f. Noise level not to exceed 37dBa

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3. Tank
  - a. Provide external tank for 150 psi working pressure
  - b. Refer to drawings for capacity.
    - 1) Tapping for relief valve installation
    - 2) glass lining on internal surfaces exposed to water
    - 3) magnesium anode rod
    - 4) four ports for heat pump connection, supply inlet and outlet

**2.2 BACKFLOW PREVENTERS**

- A. Acceptable Manufacturers:
  1. Watts, Febco, Wilkins, Hersey, Ames.
  2. Other Manufacturers: Submit Substitution Request.
- B. Double Check Valve Assembly (DCVA) Type:
  1. 1-1/2-inch Size: Cast bronze body, top mounted ball valve test cocks, two positive seating check modules with captured springs and rubber seat discs, two resilient seated isolation valves, four top mounted resilient seated test cocks.

**PART 3 - EXECUTION**

**3.1 WATER HEATER INSTALLATION**

- A. Install per manufacturer's installation instructions and in accordance with all applicable codes.
- B. Provide pressure/temperature relief valve on storage tanks. Provide piping from relief valve to floor drain utilizing a 1-inch air gap at discharge point.
- C. Support: Install water heater oriented so that controls and devices needing service and maintenance have adequate access. Install water heaters level. Provide required strapping to structure and floor in accordance with code requirements.
- D. Water Piping: Provide hot and cold water piping to units with shutoff valves, unions, and specialties as detailed on the Drawings. Provide recirculating water line to unit with shutoff valve, check valve, and union.

**3.2 BACKFLOW PREVENTERS**

- A. Install at height and location suitable for testing purposes by the local governing authority.
- B. Provide funnel drain below reduced pressure backflow device for collecting periodic discharge and testing purposes. Pipe 2-inch indirect waste from funnel drain to floor drain. Discharge indirect waste above floor drain utilizing a 1-inch air gap.

**END OF SECTION**

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**SECTION 22 40 00**

**PLUMBING FIXTURES**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 22 0500, Common Work Results for Plumbing apply to work specified in this Section.

1.2 SUMMARY

- A. This Section includes:
  - 1. Plumbing fixtures.
  - 2. Fixture trim.
  - 3. Drainage products.
  - 4. Miscellaneous plumbing items.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Product data for each item specified.
  - 2. Operating and Maintenance Data:
    - a. Sensor operated faucets.
    - b. Sensor operated flush valves.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers stated here and listed in the plumbing schedules for each fixture specified are approved for bidding except when indicated "only". Final approval for the installation based upon approval of submittal data.
- B. Mixing Valves: Powers, Leonard, Symmons, Chicago.
- C. Shock Arrestors: PPP, J.R. Smith.
- D. Other Manufacturers: Submit Substitution Request.

2.2 FIXTURE TRIM

- A. Traps:

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1. For floor drains, provide coated cast iron P-trap; recessed, screw jointed or bell and spigot.
2. For other fixtures (unless noted otherwise in this specification or on the drawings), provide 17 gauge, chrome plated cast brass P-Traps with solder bushings, and clean-out.

B. Vacuum Breakers: Chicago Faucet, A.W. Cash or Febco chrome plated.

**2.3 PLUMBING FIXTURES**

A. WC-1 Water Closets (ADA):

1. American Standard Afwall Millenium FloWise, elongated bowl vitreous china, one-piece tank type wall mount
2. 1.28 gpf with battery-operated Selectronic Flush Valve
3. MAP score >1000
4. EPA WaterSense and CEC approved

B. WC-2 Public Water Closets (ADA):

1. Acorn Penal Ware 1680, 14-gauge 304 stainless steel, satin finish, concealed siphon jet type with elongated bowl, wall mount
2. 1.28 gpf wall-supply flush valve

C. LAV-1 Lavatory (ADA):

1. Faucet: Bradley Verge Metro S53-3300, touch-free, hard-wired with battery back-up, polished chrome cast brass body
2. Soap Dispenser: Bradley Verge Metro 6-3300 touch-free, hard-wired with battery back-up, polished chrome cast brass body
3. Sink: Bradley Verge Wash Basin, 2-person wall-mount sink, finish specified by architect otherwise polished chrome.

D. LAV-2 Public Lavatory (ADA):

1. Sink & Faucet Combination: Acorn Penal-ware 1652 series 18" lavatory with oval bowl, ADA compliant, 14 gage 304 stainless steel satin finish. Pneumatically operated metering non-hold-open faucet valve with ADA compliant push-button, lead free.
2. Cold water supply only

E. S-1 Kitchen Sink (ADA):

1. Sink: Kohler Vault 25" under mount single-bowl, 18 gauge stainless steel
2. Faucet: American Standard Monterrey two-handle 8" widespread swivel gooseneck faucet, 1.5 gpm, cast brass fixture with polished chrome finish

F. S-2 Double Wide Kitchen Sink (ADA):

1. Sink: Kohler Vault 32" under mount single-bowl, 18 gauge stainless steel
2. Faucet: American Standard Monterrey two-handle 8" widespread swivel gooseneck faucet, 1.5 gpm, cast brass fixture with polished chrome finish

G. MS-1 Mop Sink:

1. Faucet: Elkay LKB940C, wall mounted utility faucet with bucket hook, threaded spout for hose connection, brass construction, brass valve bodies.

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- 2. Basin: Elkay FLR-1X, 24"x20"x11-1/2", 16Gauge, stainless steel, center drain..
  - H. DF-1 Drinking Fountain Bottle Filler (ADA):
    - 1. Elkay EZH2O Bottle Filling Station with Bi-level Integral SwirlFlo fountain, filtered, non-refrigerated, mechanically activated bubbler, visual filter indicator, wall mounted with in-wall frame/plate
  - I. Exposed Waste and Supply Piping Insulation Kits:
    - 1. McGuire Prowrap insulation kit for exposed supplies and waste piping below ADA lavatories and ADA sinks.
  - J. TP-1, TP-2, Trap Primer:
    - 1. Precision Plumbing Products Prime-Rite series Trap Primer Valve model PR-500 automatic pressure drop activated, 360 brass, EPDM E70 O-rings, Dow #7 silicone, #60 stainless steel mesh screen.
  - K. FD-1, FD-2 Floor Drains:
    - 1. Zurn Z415B cast iron body with bottom outlet, Type B polished nickel bronze, strainer per schedules.
- 2.4 DRAINAGE PRODUCTS
- A. HB-1 Hose Bibb: Chicago 952, chrome-plated, loose key, 3/4-inch hose thread, integral vacuum breaker.
  - B. HD-1 Hub Drain: Zurn Z1870, Type 304 stainless steel 6" hub drain, corrosion resistant,
  - C. CR-1 Condensate Receiver: J.R. Smith Fig. M3980-R-C, acid resistant coated interior, with underdeck clamp, sump receiver, 4-inch water dam, and dome strainer.
  - D. WCO Wall Cleanout: J.R. Smith Fig. 4530-U, round stainless steel vandalproof cover and screw.
  - E. FCO Floor Cleanout: J.R. Smith Fig. 4020-U, round vandalproof, nickel bronze top.
  - F. Water Hammer Arrestor: Precision Plumbing Products Model SC (Maintenance-Free).

**PART 3 - EXECUTION**

3.1 FIXTURE TRIM

- A. Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.
- B. Provide rough-in and final piping connection to fixtures. Carefully review all construction documents to assure that all fixtures are provided with necessary services for a complete operating system.

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- C. Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

**3.2 PLUMBING FIXTURES**

- A. Americans with Disabilities Act:
  - 1. Those fixtures indicated by "ADA" shall comply with and be installed in accordance with Americans with Disabilities Act Guidelines (A.D.A.A.G.). Where applicable building code requirements are more stringent than ADAAG guidelines, building code requirements shall be followed.
  - 2. Water Closets: Mount flush valve for ADA water closets on wide side of enclosure.
  - 3. Lavatories: Provide insulation kits on exposed hot water and waste piping beneath ADA lavatories.
  - 4. Sinks: Provide insulation kits on exposed hot water and waste piping beneath ADA sinks.
- B. Mounting Heights: All fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.
- C. Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.
- D. Floor Drain and Floor Sinks:
  - 1. Set top flush with finished floor.
  - 2. Provide flashing clamp for all drain bodies installed in floors provided with waterproof membranes.
- E. Cleanout:
  - 1. Where shown or required.
  - 2. Cover set flush with finished surface.
- F. Roof and Area Drains: Provide sump receivers for all drains except poured in place installations. Provide extension section as required to compensate for the specified insulation thickness above the roof slab or deck.
- G. Water Hammer Arresters: Provide where shown and where recommended by Plumbing Drainage Institute (PDI).
- H. Mixing Valves: Provide piping connections per manufacturer's installation instructions. Provide spring check valves on hot and cold water inlets when not provided integral to valve.

**3.3 PRIMING VALVES**

- A. All floor drains, floor sinks and similar traps shall be primed. Use minimum 3/8-inch type K annealed copper tubing. Primer line to be continuous and without joints.
- B. Where priming valves are installed in finished rooms, conceal in wall and provide access panel.

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- C. Coordinate locations of electronic trap primer stations with electrical contractor for 120V service.

END OF SECTION



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**SECTION 23 05 00**

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**COMMON WORK RESULTS FOR HVAC**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of This Section, Common Work Results for HVAC, apply to all sections in Division 23.
- C. All Sections of Division 23 are interrelated. When interpreting any direction, material, and method specified in any section of Division 23, consider it within the entirety of Work in Division 23.
- D. Section 01 18 13 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. The intent of Division 23 Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 23 and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished building systems.
- B. The Division 23 Specifications and the accompanying Drawings are complimentary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications shall supersede drawings in case of conflict.
- C. Imperative language is frequently used in Division 23 Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- D. The Drawings that accompany the Division 23 Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions shall be assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in outlet location prior to roughing-in, without cost impact.

**1.3 RELATED WORK**

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- A. The General and Supplemental Conditions apply to this Division, including but not limited to:
  - 1. Drawings and specifications.
  - 2. Public ordinances, permits.
  - 3. Include payments and fees required by governing authorities for work of this Division.
- B. Division 1, General Requirements, applies to this Division.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. General: All work and materials shall conform to the local and State codes, and all Federal, State and other applicable laws and regulations.
  - 2. Contractor responsible for obtaining and payment for all permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
- B. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects and in conformance with the Contract Documents.
- C. Apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.
- D. The entire mechanical system and apparatus shall operate at full capacity without objectionable noise or vibration.
- E. All equipment shall be installed level and true. Housekeeping pads and curbs shall account for floor or roof slope.
- F. Materials and Equipment:
  - 1. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.
  - 2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
  - 3. Furnish all materials and equipment of size, make, type, and quality herein specified.
  - 4. Equipment scheduled by performance or model number shall be considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for all changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.
- G. Workmanship:
  - 1. General: All materials shall be installed in a neat and professional manner.

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2. Manufacturer's Instructions: Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 23 Specifications, obtain clarification before starting work.

H. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction shall be made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Beams or columns shall not be pierced without permission of Architect and then only as directed.
5. All new or existing work cut or damaged shall be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished, and left in condition existing prior to commencement of work.

1.5 SUBMITTALS

A. Shop Drawings:

1. The Contract Drawings indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of all piping, ductwork and equipment installations. Shop Drawings shall be new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. All drawings shall be same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings. All drawings shall be fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Shop drawings shall be prepared in two-dimensional format.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. In general, submit product data for review on all scheduled pieces of equipment, on all equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data sheets shall include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.

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4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:

1. Shop Drawings and Product Data:
  - a. Refer to Division 1 for additional requirements related to submittals.
  - b. Submit electronic copies of shop drawings and product data for Work of Division 23 in PDF format with each item filed under a folder and labeled with its respective specification section number, article and paragraph and mark if applicable.
  - c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
  - d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, shall be included with the original submittal. Controls and Instrumentation submittals may lag but shall be complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder shall include a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities: It shall be the Contractor's responsibility to:

1. See that all submittals are submitted at one time and are in proper order.
2. Ensure that all equipment will fit in the space provided.
3. Assure that all deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.6 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS

- A. Refer to Division 1 for additional requirements.
- B. Submit one bound copy of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature shall be on 8-1/2"x11" sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for all electrically powered equipment.
- C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions shall cover all phases of control.
- D. Furnish competent engineer knowledgeable in this building system for minimum of three 8-hour days to instruct Owner in operation and maintenance of systems and equipment. Contractor shall keep a log of this instruction including dates, times, subjects, and those present and shall present such log when requested by Architect.

1.7 PROJECT CONDITIONS

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- A. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
- B. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City and Utility Company.

**1.8 WARRANTY**

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

**1.9 PROVISIONS FOR LARGE EQUIPMENT**

- A. Contractor shall make provisions for the necessary openings in building to allow for admittance of all equipment.

**1.10 TEST REPORTS AND CERTIFICATES**

- A. Contractor shall submit one copy of all test reports and certificates specified herein to the Architect.

**1.11 SUBSTITUTIONS**

- A. Contractor shall submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

**PART 2 - PRODUCTS**

**2.1 ACCESS PANELS**

- A. Furnish under this Division as specified in another Division of work.

**2.2 PIPE AND DUCT SLEEVES**

- A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.
- B. Interior Wall and Floor Sleeves (fire rated): Fire rated and watertight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves: Cast iron.

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- D. On Grade Floor Sleeves: Same as exterior wall sleeves.
- E. Watertight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

**2.3 FLOOR, WALL AND CEILING PLATES**

- A. Furnish stamped split type plates as follows:
  - 1. Floor Plates: Cast brass, chromium plated.
  - 2. Wall and Ceiling Plates: Spun aluminum.

**2.4 MACHINERY GUARDS**

- A. Furnish guards for protection on all rotating and moving parts of equipment. Provide guards for all metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.
- B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.
- C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards shall be easily removable for pulley adjustment or removal and changing of belts.
- D. All guards shall meet OSHA requirements including back plates.
- E. Provide inlet and outlet screens on all fans in plenums or where exposed to personnel.

**2.5 ELECTRICAL EQUIPMENT**

- A. General: All equipment and installed work shall be as specified under Division 26, Electrical.
- B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.
- C. Motors:
  - 1. Motors shall be furnished as integral part of driven equipment. They shall be drip proof induction type with ball bearings unless noted otherwise. Motors 1 HP and above shall be premium energy efficient type, except for emergency equipment motors. Motors shall be built to NEMA Standards for the service intended. The motors shall be rated for the voltage specified, suitable for operation within the range of 10% above to 10% below the specified voltage.
  - 2. Energy efficient motors shall be Baldor, Westinghouse, and General Electric or approved equal.
  - 3. The motor shall meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.
  - 4. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage and phase.
  - 5. Refer to individual product sections for additional motor requirements.

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- 6. Motors shall have built-in thermal overload protection or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors shall have quick trip devices.
- D. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.
- E. Equipment Wiring: Interconnecting wiring within or on a piece of mechanical equipment shall be provided with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- F. Control Wiring: All control wiring for mechanical equipment shall be provided under Section 23 09 00, Instrumentation and Controls for HVAC.
- G. Codes: All electrical equipment and products shall bear the Underwriters label as required by governing codes and ordinances.

**PART 3 - EXECUTION**

**3.1 ACCESS PANELS**

- A. Install in accord with manufacturer's recommendations, coordinated with architectural features.
- B. Provide 2-hour fire rated doors where required bearing the U.L. label.
- C. Furnish 18x18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12"x12" for walls unless indicated otherwise.
- D. Furnish where indicated and where required to access valves, fire/smoke dampers, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

**3.2 SLEEVES**

- A. Interior Floor and Wall Sleeves: Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork. Where pipe or ductwork is insulated, insulation shall pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve. Penetrations through mechanical room and fan room floors shall be made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.
- B. Sleeves Through Rated Floors and Walls: Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping or duct material, size and service.

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- C. Sleeves specified or indicated at fire damper penetrations shall take precedence over this article.
  - D. Exterior Wall Sleeves Below Grade: Provide watertight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal. Contractor shall be responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.
  - E. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.
  - F. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.
  - G. Layout work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
  - H. All floor sleeves shall maintain a water barrier by providing a watertight seal or they shall extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves shall extend 2 inches above finished floor level. Sleeves through roof shall extend 8 inches above roof. Wall sleeves shall be flush with face of wall unless otherwise indicated.
  - I. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members shall be provided so pipes are floor supported.
  - J. Special sleeves detailed on drawings shall take precedence over this section.
- 3.3 CLEANING
- A. General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.
  - B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
  - C. Additional requirements are specified under specific Sections of this Division.
- 3.4 EQUIPMENT PROTECTION
- A. Keep pipe, ductwork and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.
  - B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
  - C. Cover or otherwise suitably protect equipment and materials stored on the job site.



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**3.5 ACCESSIBILITY**

- A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms and walkways.

**3.6 FLOOR, WALL AND CEILING PLATES**

- A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates shall completely cover opening around pipe and duct.
- B. Secure wall and ceiling plates to pipe, insulation, or structure.
- C. Plates shall not penetrate insulation vapor barriers.
- D. Plates not required in mechanical rooms or unfinished spaces.

**3.7 PAINTING**

- A. General: Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting. All exposed work under this division shall receive either a factory painted finish or a field prime coat finish, except:
  - 1. Exposed copper piping.
  - 2. Aluminum jacketed outdoor insulated piping.
- B. Equipment Rooms and Finished Areas:
  - 1. Insulation: Not painted.
  - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
  - 3. Steel Valve Bodies and Bonnets: One coat of black enamel.
  - 4. Brass Valve Bodies: Not painted.
  - 5. Equipment: One coat of grey machinery enamel. Do not paint nameplates.
  - 6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers and registers flat black.
- C. Concealed Spaces (above ceilings, not visible):
  - 1. Insulation: Not painted.
  - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.
- D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

**3.8 ADJUSTING AND CLEANING**

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- A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
- B. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

**3.9 ELECTRICAL EQUIPMENT**

- A. Ductwork or piping for mechanical systems not serving electrical space shall not be installed in any switchgear room, transformer vault, telephone room, or electric closet except as indicated.
- B. Ductwork or piping for mechanical systems shall not pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

**3.10 EQUIPMENT CONNECTIONS**

- A. Make final connections to equipment specified in sections other than Division 23 of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.
- B. Piping:
  - 1. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
  - 2. All piping connections shall be independently supported to prevent undue strain on equipment.
- C. Ductwork: Make duct connections to equipment in strict accordance with manufacturer's instructions.

**END OF SECTION**

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**SECTION 23 0518**

**HVAC EXPANSION COMPENSATION**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.

**1.2 SUMMARY**

- A. This Section includes: Expansion joints and compensation.
- B. Related Sections include:
  - 1. Section 23 0529 Hangers, Supports and Anchors for HVAC.
  - 2. Section 23 0548 Vibration and Seismic Controls for HVAC Piping and Equipment
  - 3. Section 23 2113 Pipe and Pipe Fittings HVAC.
  - 4. Section 01 1813 Sustainable Design Requirements.

**1.3 QUALITY ASSURANCE**

- A. The expansion joints, pipe guides, and related supports, braces, and anchorages to building structure shall be designed to absorb thermal expansion and contraction of piping and terminal movement, as well as resist the static and dynamic loads due to fluid flow at design conditions, hydraulic testing pressures, and seismic forces.
- B. The system of expansion joints, guides, and related supports, braces, and anchorage to building structure shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
- C. Use expansion joints in straight lengths of rigid pipe; preferably welded steel, anchored and guided in accordance with best practices recommendations of Crocker and King, Piping Handbook, latest edition.
- D. Avoid use of expansion joints in conjunction with U-bends or other piping systems with "inherent" flexibility, such as Victaulic piping with flexible couplings. If expansion joints are used in piping with bends, thorough analysis of pipe stresses and deflections shall be conducted and extra care and attention shall be paid to radial thrust capacity of pipe guides, braces, and anchors.
- E. Design shall include:
  - 1. Pipe stress analysis indicating loads, deflections, and pipe stress at critical points throughout the piping systems under the following conditions:
    - a. At hydraulic design test pressure and ambient water temperature.

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- b. At design operating temperature, pressure, and flow.
  - c. Model number, size, location, and details of expansion joints, compensator guides, supports, braces, and anchorage to building structure, with substantiating calculations that the components and building can accept the calculated loads and deflections.
  - d. Detailed shop drawings stamped and signed by a registered professional engineer.
  - e. Structural details and calculations stamped and signed by a registered professional structural engineer.
- F. Expansion Joints to be designed and manufactured to the current Expansion Joint Manufacturers Association (EJMA) standards. Manufacturer of expansion joints to be certified by EJMA.
- 1.4 SUBMITTALS
- A. Submit the following:
- 1. Product data.
  - 2. Shop Drawings showing details of construction, dimensions, arrangement of components, and isolation.
  - 3. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
  - 4. Specified testing requirements.
  - 5. Operating and maintenance data.

**PART 2 - PRODUCTS**

2.1 EXPANSION JOINTS AND COMPENSATORS

- A. Acceptable Manufacturers:
- 1. Flexonics, Keflex, Hyspan, Metraflex..
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description:
- 1. Expansion compensators to be of the packless, externally pressurized type to allow for axial movement constructed of stainless steel bellows, stainless steel shroud, integral guide rings, internal liner, limit stops, with drain port and plug.
  - 2. All materials of construction and pressure ratings shall be appropriate for the application as specified for each piping material and service.

2.2 PIPE GUIDES

- a. Acceptable Manufacturers: Hyspan, Grinnell, Flexonics, Adscos, Pipe Shields Inc., Unistrut, or equal.
- b. Spider Clamp Assembly: Heavy gauge pressed steel, fusion welded, bolted construction, black enamel finish. Hyspan series 9500, or equal.

**PART 3 - EXECUTION**

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3.1 EXPANSION JOINTS AND COMPENSATORS

- A. Install in all piping risers in wood structures to compensate for 1/2" of shrinkage per floor. Contractor is responsible to determine quantities and locations required.
- B. Install in piping to compensate for thermal expansion and contraction. Contractor is responsible to determine quantities and locations required.
- C. Install in other locations indicated on the drawings.
- D. Provide and install pipe alignment guides as recommended by the expansion joint manufacturer with the first guide no more than 4 pipe diameters away from the expansion joint or compensator and second guide no more than 14 pipe diameters from first guide.
- E. Install per manufacturer's installation instructions.

**END OF SECTION**

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**SECTION 23 05 19**

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**METERS AND GAUGES FOR HVAC**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes:
  - 1. Thermometers
  - 2. Pressure Gauges
  - 3. Differential Pressure Gauges

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Products listed in this section.
  - 2. Water flow meters, include graph of output signal vs. gpm for each device.
  - 3. Operating and Maintenance Data.

**PART 2 - PRODUCTS**

2.1 THERMOMETERS, WATER

- A. Acceptable Manufacturers:
  - 1. Ashcroft, Weiss, Trerice, Marsh, Weksler, Tel-Tru.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Direct drive 4-1/2-inch dial type, stainless steel case, separable sockets, stem length to penetrate minimum of 1/2 pipe diameter, adjustable face, extension necks where required to clear insulation.
- C. Range:

<b>HVAC Systems</b>	<b>Temperature °F</b>	<b>Graduations (°F)</b>
Chilled Water	25-125	1
Heating Water	30-240	2

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**2.2 PRESSURE GAUGES - GENERAL**

- A. Acceptable Manufacturers:
  - 1. Marsh, Ashcroft, Weiss, Terrice, Weksler, Tel-Tru.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description: 4-1/2-inch dial, molded black polypropylene turret case.
- C. Range:

<b>HVAC Systems</b>	<b>Pressure (psi)</b>	<b>Graduations (psi)</b>
Chilled water	0-100	1
Heating water	0-100	1

**2.3 DIFFERENTIAL PRESSURE GAUGES**

- A. Description: Surface mounted diaphragm-actuated dial type with zero pointer adjustment. Provide 4-inch minimum dial diameter with black figures on a white background.
- B. Tubing: Copper; polytube may be used if concealed inside walls.
- C. Manufacturer:
  - 1. Between Rooms: Dwyer magnahelic Model 2000-00, 0-0.25 inches of water range.
  - 2. Across Filters: Dwyer magnahelic Model 2002-AF, 0-2.0 inches of water range with air filter gauge accessory package.

**PART 3 - EXECUTION**

**3.1 INSTALLATION - GENERAL**

- A. Provide meters and gauges where shown on Drawings.
- B. Install all gauges and meters as required and as recommended by equipment manufacturer or their representative.
- C. Extend all connections, wells, cocks, or gauges to a minimum of 1-inch beyond insulation thickness of the various systems.
- D. Locate all gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area, i.e., platform, catwalk, etc.
- E. Install instruments over 6'-6" above floor, to be viewed from the floor, with face at 30 degrees to horizontal.

**3.2 INSTALLATION - PRESSURE GAUGES**

- A. Provide instrument gauge cock at inlets. Provide protective siphon on steam gauges.

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- B. Locate pressure gauge taps for measuring pressure drop or increase across pumps, coils, condensers, etc., as close to the device as possible.

**END OF SECTION**



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**SECTION 23 05 23**

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**GENERAL DUTY VALVES AND SPECIALTIES FOR HVAC**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC, apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes: Valves, general purpose gauge cocks, and balance fittings.

1.3 SUBMITTALS

- A. Submit product data.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURER VALVES

- A. General: Where only Nibco figure numbers are listed, equivalent products by those specified below are acceptable.
  - 1. Gate, Globe, Swing Check: Victaulic, Crane, Kennedy, Stockham, Milwaukee, Walworth and Hammond.
  - 2. Silent Check: Mueller, Metraflex, Victaulic, Bell and Gossett, Milwaukee and Gruvlok.
  - 3. Balancing: DeZurik, Homestead, Bell and Gossett, Armstrong, Walworth, Taco, Wheatley, Tour and Andersson, Victaulic, Gruvlok, and Nibco.
  - 4. Butterfly: Victaulic, Gruvlok, Crane, Walworth, Milwaukee and Metraflex.
  - 5. Ball: Gruvlok, Apollo, Crane, Hammond, Milwaukee and Victaulic.
- B. Other Manufacturers: Submit Substitution Request.
- C. All such valves shall be of one manufacturer.
- D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 23 2113 for allowable fittings.

2.2 GLOBE VALVES

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- A. Bronze Globe and Angle Globe: Bronze body, bronze mounted, renewable composition disc, 150 psi rating; Nibco 235 or 335.
- B. Iron Globe: Iron body, bronze mounted, OS and Y pattern, renewable composition disc, 125 psi rating; Nibco 718-B.

**2.3 CHECK VALVES**

- A. Horizontal Bronze Swing Check: Bronze body, bronze mounted, regrinding bronze disc, 150 psi steam rating, 300 psi WOG; Nibco 433-Y.
- B. Horizontal Iron Swing Check: Iron body, bronze mounted, regrinding bronze disc and seat ring, 125 psi rating; Nibco 918.
- C. Vertical and Silent Check Valves:
  - 1. 250-lb. WOG, iron body, stainless steel trim, globe type with flanged ends; Nibco 960.
  - 2. 300-psig CWP, ductile iron body, stainless steel spring and shaft. Victaulic Series 716.
  - 3. 230-psig CWP, AGS grooved end ductile iron body, stainless steel spring, shaft, and disc, EPDM seat. Victaulic Series W715.
- D. Vertical and Silent Check Valves: 250-lb. WOG, iron body, stainless steel trim, wafer type; Nibco W-960.

**2.4 BALL VALVES**

- A. Bronze Ball: Bronze cast body or forged brass, chrome-plated full port ball, with handle, Teflon seat, 300 psi WOG, 150 psi steam; Nibco 585-70 or Victaulic Series 589.

**2.5 BUTTERFLY VALVES**

- A. Ductile iron body, electroless-nickel chrome plated disc and stainless steel shaft (shaft shall be offset from the disc centerline to provide complete 360-degree circumferential seating), with lever handle and locking feature on valves 6-inches and less, gear operator on valves 8-inches and over; stem neck length to accommodate insulation where applicable, pressure responsive EPDM liner, 300 psi water; Victaulic MasterSeal, Nibco 2000, Nibco 4765.
- B. Copper Grooved Piping System Butterfly Valve: Nylon coated or Cast bronze body per Copper Development Agency-836, ductile iron disc encapsulated with EPDM coating, lever handle up to 6-inches, gear operator on valves 8-inches and greater, stem length to accommodate insulation, 300 psi water; Victaulic Series 608, per ASTM A-584.
  - 1. Grooved ends shall be manufactured to copper-tubing sizes. Flaring tube or fitting ends to accommodate alternate sized couplings is not permitted.

**2.6 AUTOMATIC FLOW CONTROL VALVES**

- A. Acceptable Manufacturers:
  - 1. Griswold, Flow Design.

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- 2. Other Manufacturers: Submit Substitution Request.
  - B. Furnish automatic pressure compensating flow control valves.
  - C. Valves factory set and calibrated within 5% of indicated water flow rate. Provide taps for measuring of flows with quick disconnect valves.
  - D. Field adjustable flow rate with adjustable flow control cartridge.
  - E. Provide identification tags for each valve indicating type, flow characteristics, etc.
  - F. 150 psi operating pressure.
  - G. Where required, strainers and isolation valves shall be provided separately from flow control valves.
  - H. Size flow control valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.
- 2.7 PRESSURE INDEPENDENT CONTROL VALVE
- A. Acceptable Manufacturers:
    - 1. Flow Control Inc. "Delta P Valve".
    - 2. Other Manufacturers: Submit Substitution Request.
  - B. Description:
    - 1. Chilled water and heating water control valves shall be dynamic, modulating, 2-way control device.
    - 2. Dynamic control valve shall accurately control flow, independent of system pressure fluctuation, from 0 to 100% full rated flow.
- 2.8 SPECIALTY VALVES
- A. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4 inch; Conbraco 41 series.
  - B. Drain Valves: Bronze globe valve or full port ball valve, garden hose end, cap and chain 3/4 inch size.
- 2.9 SYSTEM SPECIALTIES
- A. Manual Air Vents: Coin type; Dole No. 9 or approved equal.
  - B. Automatic Air Vents:
    - 1. Acceptable Manufacturers:
      - a. Hoffman No. 78, Amtrol, Armstrong, Spirax/Sarco, Spirotop.
      - b. Other Manufacturers: Submit Substitution Request.
    - 2. Description: Water main type, cast brass body, built-in check valve, 1/8-inch I.P.S. top tapping for moisture discharge, 3/4-inch size, 150 psi operating pressure.

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- C. Pressure/Temperature Test Plug:
1. Acceptable Manufacturers:
    - a. Peterson Engineering, Inc., Universal Lancaster, Sisco, Trerice.
    - b. Other Manufacturers: Submit Substitution Request.
  2. General: 1/2-inch N.P.T. fitting to receive either a temperature or pressure probe 1/8-inch O.D., fitted with a color coded and marked cap with gasket.
  3. Material: Solid brass with valve core of Nordel.
  4. Rating: Minimum 300 psig at 275°F.
  5. Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch O.D. probe and two five-inch stem pocket test thermometers 25°-125°F for chilled water, 40°-240°F for heating water.

2.10 AIR SEPARATOR – HIGH EFFICIENCY COALESCING

- A. Acceptable Manufacturers:
1. Spirotherm "Spirovent" model [VSR] [VDT].
  2. Other Manufacturers: Submit Substitution Request.
- B. Description:
1. Turbulence suppressive type air eliminator to separate microbubbles and to remove stationary air pockets through absorption. Brass or steel body with centerlined inlet and outlet for in-line piping. Valved side tap to bleed large amounts of air during system fill.
  2. Spirotubing made of copper wire woven around central copper tube inside housing. Integrated brass venting mechanism on top. Blowdown connection port at bottom.
  3. Maximum working pressure, 150 psi. Maximum working temperature 270°F. Maximum allowable water velocity, 4ft/second. Maximum pressure drop 0.5 ft.
  4. Air elimination efficiency of 100% free air, 100% entrained air, 99.6% dissolved air.
  5. Dirt separation efficiency of 80% of particles 30 micron and larger with 100 passes.

2.11 IN-LINE AIR PURGER

- A. Acceptable Manufacturers:
1. American Air Purger with Model #720 eliminator.
  2. Other Manufacturers: Submit Substitution Request.
- B. Description: Fabricated steel air purger with flanged inlet and outlet, disked air entrapment head, purger, and drain coupling.
- C. Eliminator: Air eliminator by the same manufacturer shall be capable of eliminating air as fast as it can be separated. Design eliminator so that air cannot be drawn into the system if negative pressures occur.
- D. Size: Purger to be line size.

2.12 PRESSURE REDUCING VALVE (CLOSED HYDRONIC SYSTEM FEED)

- A. Acceptable Manufacturers:

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1. Bell & Gossett, Armstrong, Taco, Amtrol, Cash Acme.
  2. Other Manufacturers: Submit Substitution Request.
- B. Description: Self-filling type with low inlet pressure check valve, removable strainer, adjustable range, and set point as indicated on the Drawings.
- C. Construction: Iron body for steel piping installation, brass body for copper piping installation. All working parts shall be brass.
- D. Size: 3/4-inch unless shown otherwise.

**2.13 WATER RELIEF VALVES**

- A. Acceptable Manufacturers:
1. Consolidated, Kunkle, B&G, Armstrong, Cash Acme.
  2. Other Manufacturers: Submit Substitution Request.
- B. Description: Bronze or steel body, stainless steel or bronze, pressure settings to 160 psi at 250°F, conforming to Section IV of ASME Code, size per manufacturer's recommendations based on Code, setting as indicated; Kunkle Model 537.

**2.14 STRAINERS**

- A. Acceptable Manufacturers:
1. Nibco, Armstrong, McAlear, Sarco, Steamflo, Mueller, R.P. & C. Company Titan Flow Control.
  2. For Grooved Coupling Systems: Gruvlok or Victaulic.
  3. Other Manufacturers: Submit Substitution Request.
- B. Wye Pattern:
1. Bronze: Bronze body, 250 psi, 1/16-inch perforated type 304 stainless screen.
  2. Ductile Iron: Ductile iron body, 300 psi, 1/16 or 1/8-inch 304 stainless steel screen.
  3. Cast Iron: Cast iron body, 125 psi, 1/16-inch perforated type 304 stainless screen.
  4. Cast Iron, High Pressure: Cast iron body, 250 psi, 1/16-inch perforated type 304 stainless screen.
- C. Basket Pattern: Semisteel body, 125 psi WOG, flanged, 1/8-inch perforated type 304 stainless steel screen, closed bottom basket, clamped or bolted cover.

**2.15 DIFFERENTIAL PRESSURE REGULATOR VALVE**

- A. Acceptable Manufacturers:
1. Jordan Mark 67D, Hoffman, Clayton.
  2. Other Manufacturers: Submit Substitution Request.
- B. Externally piloted differential pressure regulating valve. Ductile iron construction, stainless steel and bronze trim and 316 SS seats.

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**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Provide valves at connections to equipment where shown or required for equipment isolation.
- B. Install all valves and strainers in accessible locations and same size as connected piping (not the size of the equipment connection), except balancing valves shall be sized by the contractor to properly balance the flow.
- C. Provide separate support for valves where necessary.
- D. Grooved type valve end connections may be used in lieu of flanged on the following services:
  - 1. Chilled water.
  - 2. Heating water.
- E. Provide drain valves in all low points in the piping system, at coils and equipment, and as indicated.

**3.2 APPLIED LOCATIONS HVAC VALVES**

- A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
<b>Chilled Water</b>	Not Allowed	Bronze	Bronze	Bronze	Not Allowed
<b>Heating Water</b>	Not Allowed	Bronze	Bronze	Bronze	Not Allowed

- B. In piping 2-1/2-inches and larger:

System	Valve Types				
	Gate	Globe	Check	Ball	Butterfly
<b>Chilled Water</b>	Not Allowed	Iron	Iron, Swing	Not Allowed	Ductile Iron
<b>Heating Water</b>	Not Allowed	Iron	Iron, Swing	Not Allowed	Ductile Iron

- C. Automatic flow control valves on water coils and in piping systems in accordance with manufacturer's recommendations to automatically balance water flow in piping loops as indicated.
- D. Pressure Independent Control Valve on water coils and in piping systems in accordance with manufacturer's recommendations. Valves shall be coordinated with Section 23 09 00, Instrumentation and Controls for HVAC.
- E. Provide gauge cock for all pressure gauges.

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- F. Provide gate valves with pressure type packing glands for heating water boiler shutoff applications. Valves shall meet requirements of ASME Boiler and Pressure Vessel Code, Section IV, Article 7 for Stop Valves.

**3.3 VALVE IDENTIFICATION**

- A. General: Identify valves to indicate their function and system served.
- B. See Section 23 05 53, Identification for HVAC Piping and Equipment.

**3.4 CHAIN OPERATORS**

- A. All valves in equipment rooms or fan rooms used for equipment or coil isolation and more than 8 feet above floor shall be installed with stem horizontal and equipped with chain wheels and chains extending to 6 feet above floor.

**3.5 INSTALLATION**

- A. Manual Air Vents:
  - 1. Install at all high points where automatic air vents are not used, where noted, and where required for proper venting of system.
  - 2. Install in accordance with manufacturer's recommendations.
- B. Automatic Air Vents:
  - 1. Install automatic air vents at high points where air can collect in water systems where indicated. Route drain lines from vent to nearest floor drain.
  - 2. Install 3/4-inch globe shut-off valve ahead of air vent. Install ball valve where bucket drainage is required.
- C. Grooved joints shall be installed in accordance with the manufacturer's published installation instructions. Gaskets shall be molded and produced by the coupling manufacturer, and shall be suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the project site to ensure best practices in grooved installation are being followed. (A distributor's representative is not considered qualified to conduct the training or field visits.)
- D. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.
- E. Coil Connectors:
  - 1. Applied Locations: Integrated coil connectors are prohibited except where specifically indicated below or on the drawings.
  - 2. Make all connections in accordance with Section 23 2113, Pipe and Pipe Fittings HVAC.
- F. Expansion Tanks:
  - 1. Support with steel rods and brackets from structure or from structural steel stand as required.
  - 2. Pipe valve drain to over floor drain.

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- G. Air Separator:
1. Install as shown on Drawings and in accordance with the manufacturer's recommendations.
  2. Suspend from structure with steel rods or brackets or support from steel stand as required.
  3. Bleed system air at start-up according to manufacturer's recommendations.
- H. In-Line Air Purger:
1. Install purger and eliminator as shown on Drawings and in accordance with the manufacturer's printed recommendations. Support separately from structure with spring isolators as required.
  2. Install bronze globe shut-off valve between the purger and eliminator.
  3. Pipe discharge to nearest floor drain using Schedule 40 galvanized steel pipe.
- I. Pressure Reducing Valves:
1. Install where indicated and in accordance with manufacturer's recommendations with 3 valve bypass.
- J. Water Relief Valves:
1. Install where indicated, and in accordance with manufacturer's instructions. Pipe discharge to nearest floor drain using Schedule 40 steel pipe.
- K. Strainer:
1. Provide valved blow off for each strainer of same size as plugs with maximum size of 1-1/2 inches. Pipe blow off full size and terminate over floor drains except finned tube, reheat coils, fan coils, terminal units, and unit heaters.
  2. Applied Locations HVAC:
    - a. Cast iron wye, chilled, heating and heat recovery water, low pressure steam, low pressure condensate.
    - b. Bronze wye, in piping 2-inch and smaller, medium and high pressure steam and condensate.
    - c. Cast iron, high pressure wye, in piping 2-1/2-inch and larger, medium and high pressure steam and condensate,.
    - d. Basket, in piping 2-1/2-inch and larger, condenser water inlet to pumps.
- L. Differential Pressure Regulating Valve:
1. Install per manufacturer's recommendations where shown on plans.

END OF SECTION



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**SECTION 23 05 29**

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**HANGERS, SUPPORTS AND ANCHORS FOR HVAC**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes: Supports and anchors for piping systems and equipment.
- B. Related Sections include:
  - 1. Section 23 0548 Vibration and Seismic Controls for HVAC Piping and Equipment.
  - 2. Section 23 0700 Insulation for HVAC.
  - 3. Section 23 2113 Pipe and Pipe Fittings HVAC.

**1.3 QUALITY ASSURANCE**

- A. Provide pipe and equipment hangers and supports in accordance with the following:
  - 1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor shall be responsible for their design.
  - 2. Seismic restraints and anchorages shall resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
  - 3. Seismic restraint shall not introduce excessive stresses in the piping caused by thermal expansion or contraction.
  - 4. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
  - 5. Seismic restraints shall be in accordance with the latest edition of the SMACNA "Seismic Restraint Manual - Guidelines for Mechanical Systems" for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
  - 6. Seismic restraints shall be in accordance with the applicable code.
  - 7. Seismic restraints shall follow the provisions described in Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.

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- B. Engineered Support Systems: The following support systems shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
  - 1. Supports and seismic restraints for suspended piping and equipment.
  - 2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
  - 3. Equipment and piping support frame anchorage to supporting slab or structure.

1.4 SUBMITTALS

- A. Submit the following:
  - 1. Shop Drawings of contractor fabricated support structures.
  - 2. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
  - 3. No other submittals required under this section.

**PART 2 - PRODUCTS**

2.1 SUPPORTS, GENERAL

- A. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.
- B. Acceptable Manufacturers: Unistrut, Superstrut, Powerstrut and Kinline, B-Line Systems, AnvilStrut.
- C. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
- D. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.
- E. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.2 PIPE ATTACHMENTS

- A. Acceptable Manufacturers: Anvil as noted or equivalent products by Superstrut, B-Line Systems, Tolco, Michigan Hanger.
- B. Uninsulated Horizontal Copper Piping:
  - 1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
  - 2. Larger than 2-inch: Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods. Electricians' tape is unacceptable.
- C. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.
- D. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:

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1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
  2. Larger than 2-inch: Anvil 260.
- E. Other Uninsulated Horizontal Pipe:
1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
  2. Larger than 2-inch: Anvil 260.
- F. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
  2. Larger than 2-inch: Anvil 260.
- G. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
  2. Larger than 2-inch: Anvil 260.
- H. Riser Clamps Copper Pipe:
1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
  2. Larger than 4-inch: Anvil 261C.
- I. Riser Clamps Other Piping: Anvil 261.
- 2.3 PIPE ROLLERS, INSULATION PROTECTION SHIELDS AND INSULATION PROTECTION SADDLES
- A. Acceptable Manufacturers: Anvil as noted or equivalent Super Strut, B-Line Systems, Tolco, Michigan Hangers.
- B. Pipe Rollers: Anvil 174 or 274 as required. Size for pipe plus insulation for insulated pipe.
- C. Insulation Protection Shields: Anvil 167.
- D. Insulation Protection Saddles: Anvil 160 through 166A as required. Saddles for copper pipe, factory or field copper plated.
- 2.4 BUILDING ATTACHMENTS
- A. Acceptable Manufacturers: Anvil as listed or equivalent products by Elcen, Superstrut, B-Line Systems, Tolco, Michigan Hangers.
- B. Beam Hangers:
1. On piping 6-inch and smaller: Anvil 86 with retaining clip Fig. 89.
  2. On piping larger than 6-inch: Anvil 228, or 292.
- C. Inserts: Anvil 152 malleable iron or 281 steel inserts. Inserts sized for required rod to support load being carried.
- D. Expansion Plugs: Similar and equal to Phillips "red-head" self-drilling flush shell selected for safety factor of 4.
- E. Powder actuated fasteners with silencers as approved by Architect.

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**PART 3 - EXECUTION**

**3.1 HANGERS AND SUPPORTS**

**A. General:**

1. Install all support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the Drawings.
2. Provide adjustable hangers for all pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
4. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
5. Support all piping within 2 feet of each change of direction on both sides of fitting.

**B. Insulated Piping Systems:**

1. See Section 23 07 00 for insulation requirements.
2. Insulated Piping Systems with Vapor Barrier Insulation:
  - a. Install hangers outside of insulation.
  - b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
3. Heating Water (over 230°F), Medium Pressure Steam and High Pressure Steam (Non-Vapor Barrier Insulation):
  - a. As specified for Insulated Piping Systems with Vapor Barrier Insulation.
4. Other insulated Piping Systems with Non-Vapor Barrier Insulation:
  - a. As specified for Insulated Piping Systems with Vapor Barrier Insulation.
5. Insulation Protection:
  - a. Band insulation protection shields firmly to insulation to prevent slippage.
  - b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

**C. Vertical Piping:**

1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
3. Risers that are not subject to thermal change to be supported at each floor of penetration.
4. Risers that are subject to thermal change require engineered supports. Size supports to carry all forces exerted by piping system when in operation. Riser supports shall follow the provisions described in Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment.

**D. Horizontal Piping:**

1. Trapeze Hangers: Multiple pipe runs where indicated shall be supported on channels with rust resistant finish. Provide all necessary rods and supporting steel.

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2. Support Spacing: Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
- a. Support piping within 2 feet of each change in direction.
  - b. Steel Pipe, Copper Tubing:

<b>Minimum Pipe Size</b>	<b>Max. Span Steel</b>	<b>Max. Span Copper</b>	<b>Rod Size</b>
1-inch and smaller	7 feet	5 feet	1/4-inch
1-1/4-inch to 2-inch	8 feet	8 feet	3/8-inch
2-1/2-inch to 3-inch	11 feet	9 feet	1/2-inch

- c. Piping provided with acoustical lagging wrap shall be supported a maximum of 5 feet on center. Install hangers outside of acoustical lagging.

E. Building Attachments:

- 1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support all piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
- 2. Provide horizontal bracing on all horizontal runs 1-1/2 inch and larger and exceeding 50 feet in length at 75 foot intervals and as required to provide stabilized piping systems.
- 3. Provide all additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
- 4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

**END OF SECTION**

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**SECTION 23 0548**

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**VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes:
  - 1. Isolation of mechanical equipment as indicated on the Drawings and specified herein.
  - 2. Seismic restraint of equipment, piping and ductwork.
- B. Related Sections include:
  - 1. Section 23 0518 HVAC Expansion Compensation.
  - 2. Section 23 0529 Hangers, Supports and Anchors for HVAC.
  - 3. Section 23 3101 HVAC Ducts and Casing-Low Pressure.
  - 4. Section 23 3102 HVAC Ducts and Casing-Medium Pressure.

**1.3 QUALITY ASSURANCE**

- A. A single manufacturer shall select and furnish all isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this specification.
- B. The system of vibration isolators and seismic controls shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
- C. Isolation performance requirements are indicated on the Drawings. All deflections indicated are nominal static deflections for specific equipment supported.
- D. Seismic snubbers, restrained isolator housings and cable system components shall have anchorage preapproval "OPA" number from OSHPD in the State of California verifying the maximum certified load ratings.
- E. Isolator Stability and Rated Capacity:
  - 1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.

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2. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

F. Seismic Restraints:

1. Restraint of equipment, piping and ductwork to be in accordance with the current state and local Building Code.
2. All calculations shall be in accordance with current state and local Building Code.

1.4 SUBMITTALS

A. Submit the following:

1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
  - a. Equipment mounting holes.
  - b. Dimensions.
  - c. Isolation selected for each support point.
  - d. Details of mounting brackets for isolator.
  - e. Weight distribution for each isolator.
  - f. Code number assigned to each isolator.
2. Submit product data and calculation sheets for isolators, showing:
  - a. Size, type, load rating and rated deflection of each required isolator.
  - b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
3. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.

B. Installation report as specified in Part 3 of this section.

C. Operation and maintenance data.

1.5 EQUIPMENT VIBRATION ISOLATION

A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.

B. Isolation work to include, but not necessarily be limited to, the following:

1. Isolation support of motor-driven equipment.
2. Inertia base frames in conjunction with isolation.
3. Isolation support of air-handling housings.
4. Isolation support of piping, piping risers, and ductwork.
5. Penetration isolation of pipework, ductwork, and conduits through walls, floors or ceilings.
6. Flexible connections of ductwork and piping to equipment.

C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:

1. Rotating equipment operating peak vibration velocities must not exceed 0.08 in./sec.

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2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment shall be repaired or replaced at no expense to the owner until approval of the equipment is given by the engineer.

D. Any components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment, shall be provided.

**1.6 ACCEPTABLE MANUFACTURERS**

A. Amber Booth.

B. Mason Industries, Inc.

C. Kinetics Corporation.

D. Vibrex.

E. Approved equal, meeting all of the conditions and requirements specified herein.

**1.7 CONTRACTOR RESPONSIBILITY**

A. All vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single manufacturer or suppliers.

B. Adequately restrain all equipment, piping, and ductwork to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Design and applicable state and local codes.

C. In addition, the contractor shall have the following responsibilities:

1. Selection, installation, adjustment and performance of vibration isolators which will meet the requirements given on the plans or in the specifications.
2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

**PART 2 - PRODUCTS**

**2.1 TYPE 2 - RESTRAINED NEOPRENE MOUNT**

A. Bridge-bearing neoprene mountings shall have all directional seismic capability.

B. Provide minimum deflection of 0.2-inch.

C. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements.

D. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation.



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- E. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications.
- F. Manufacturer: Mason type BR.

**2.2 TYPE 3 - SPRINGS**

- A. Free standing springs without housings.
- B. Provide minimum deflection of 1-inch.
- C. 1/4-inch thick molded neoprene cup with steel reinforcement washer or neoprene acoustical friction pads between base plate and support.
- D. All mounting shall have leveling bolts with height saving brackets.
- E. Springs mounted outboard of channels.
- F. Attach baseplate screws using neoprene bushings and washers.
- G. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
- H. Manufacturer: Mason type SLF, Amber-Booth type SW, Kinetics Corporation, Vibrex.

**2.3 TYPE 4 - SPRINGS WITH RESTRAINTS**

- A. Same as springs except housing with seismic restraints to be added.
- B. Seismic restraint with molded all directional neoprene bushings an integral part of isolator.
- C. Seismic restraint selected for minimum safety factor of 2 from ultimate seismic capacity.
- D. Spring mount must have neoprene cup or pad inside the seismic housing to allow anchoring of the housing baseplate without short circuiting pad.
- E. Manufacturer: Mason type SLR 100 2" deflection.

**2.4 TYPE 7 - ISOLATING SPRING HANGERS**

- A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.
- B. Provide minimum deflection of 1-inch.
- C. Isolators shall have the proper deflection to allow the piping to deflect as a unit with the pump isolators.
- D. Hangers designed for 30 degree angular movement.
- E. Minimum deflection shall be one inch.

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F. Manufacturer: Mason 30N, similar Amber-Booth, Consolidated Kinetics, Vibrex.

2.5 ISOLATING SLEEVES

A. Provided for all piping through walls and floors. Size for piping as required.

B. Manufacturers: Potter-Roemer PR isolators or Grinnell Semco Trisolators.

2.6 SEISMIC RESTRAINTS

A. General Requirements:

1. Seismic restraints shall be provided for all equipment, piping and ductwork, both supported and suspended.
2. Bracing of piping and ductwork shall be in accordance with the code and with the provisions set forth in the SMACNA seismic restraint manual.
3. The structural requirements for the restraints, including their attachment to the building structure, shall be reviewed and approved by the structural engineer.
4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:

1. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
2. Bushing shall be replaceable and a minimum of 1/4-inch thick. Rated loadings shall not exceed 1000 psi.
3. An air gap of 1/4-inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
4. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to ensure no short circuits exist before systems are activated.
5. Snubber shall be type Z-1225 as manufactured by Mason Industries, Inc.

C. Bracing of Pipes:

1. Provide seismic bracing of all piping as detailed below to meet the building code requirements:
  - a. Exception: Piping suspended by individual hanger's 12-inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced where the following criteria are met.
    - 1) Seismic braces are not required on high deformability piping when the  $I_p=1.0$  and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inches diameter or less.
    - 2) Seismic braces are not required on high deformability piping when the  $I_p=1.5$  and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.

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4. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12-inches or more from the supporting structure, shall be braced on each side of a change in direction of 90 degrees or more. Riser joints on unsupported sections of piping shall be braced or stabilized between floors.
5. Vertical risers shall be laterally supported with a riser clamp at each floor.

**D. Bracing of Ductwork:**

1. Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28 inches and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size.
2. Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached, and the  $l_p=1.0$ .
3. Transverse bracing shall occur at the interval specified in the SMACNA tables or at both ends if the duct run is less than the specified interval. Transverse bracing shall be installed at each duct turn and at each end of a duct run, with a minimum of one brace at each end.
4. Longitudinal bracing shall occur at the interval specified in the SMACNA tables with at least one brace per duct run. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
5. Install duct flex connections at equipment connections to accept expected differential displacement and protect the equipment connection from damage.

**E. Suspended Equipment and Piping and Ductwork:**

1. Seismic cable restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
3. Cable assemblies shall be type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
4. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall be type SRC or UC as manufactured by Mason Industries, Inc.
5. Pipe clevis cross-bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.

**2.7 FLEXIBLE SPHERE CONNECTOR**

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- A. Flexible EPDM pipe connectors shall be manufactured of multiple plies of Kevlar tire cord fabric and EPDM; both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement.
- B. Connectors up to and including 2-inch diameter may have a single sphere and threaded ends. Connectors 2-1/2-inch and larger shall be manufactured with twin spheres up to 12-inches and a single sphere on larger sizes and floating steel flanges recessed to lock the connectors raised face EPDM flanges.
- C. All connectors shall be rated a minimum of 150 psi at 220°F. All connections shall be pre-extended as recommended by the manufacturer to prevent additional elongation under pressure.
- D. Mason type SFU, SFDEJ or SFEJ.

**2.8 FLEXIBLE HOSE CONNECTOR**

- A. Flexible stainless steel hoses shall be manufactured using type 304 stainless steel hose and braid with one fixed and one floating raised face carbon steel plate flange.
- B. Sizes 2-1/2-inch (65mm) and smaller may have threaded male nipples or copper sweat ends. Grooved ends are acceptable in all sizes in grooved piping systems. Weld ends are not acceptable. Copper sweat end hoses for water service shall be all copper or bronze construction.
- C. Hose shall have close pitch annular corrugations for maximum flexibility and low stiffness. Tested hose stiffness at various pressures must be included in the submittals.
- D. Hose shall be capable of continuous operation at 150 psi and system test pressure when installed in piping systems.
- E. Hose shall be the same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required.
- F. Mason type BSS, FFL, MN, CPS or CPSB, similar HCi, Metraflex.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Do not install any equipment or pipe which makes rigid contact with the building. "Building" includes slabs, beams, studs, walls, etc.
- B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.

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- C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

**3.2 PREPARATION**

- A. Treat all isolators, including springs, hardware and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.
- B. Coat steel frames exposed to weather with a rustproof metal primer.
- C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

**3.3 INSTALLATION**

- A. General:
  - 1. Install isolation where indicated on the Drawings by type and location and where indicated below.
  - 2. The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.
  - 3. Anchor isolator seismic housing baseplate to floor.
  - 4. Rubber grommets and washers shall be provided to isolate the bolt from the building structure. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the building structure.
- B. Type 2 – Restrained Neoprene Mount
  - 1. Service:
    - a. Ceiling Exhaust Fans
    - b. Small Cabinet Fans
    - c. Inline Centrifugal Fans
    - d. Air to air energy recovery units
- C. Type 3 – Springs
  - 1. Service:
    - a.
- D. Type 4 – Springs with Restraints
  - 1. Service:
- E. Type 5 – Base with Springs
  - 1. Service:
    - a. Air Cooled Condensing Unit
- F. Type 6 – Inertia Base with Springs
  - 1. Service:
- G. Type 7 – Isolating Spring Hangers
  - 1. Service:
    - a. In-Line Circulating Pumps
    - b. Inline Centrifugal Fans
    - c. Air to air energy recovery units

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- H. Type 8 – Isolating Neoprene Hanger
  - 1. Service:
    - a. In-Line Circulating Pumps
    - b. Air to air energy recovery units

**3.4 SEISMIC RESTRAINTS**

- A. General:
  - 1. Install and adjust seismic restraints so that the equipment, piping, and ductwork support is not degraded by the restraints.
  - 2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.
- B. Supported Equipment:
  - 1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
  - 2. Care must be taken so that the 1/4-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.
- C. Bracing of Pipes:
  - 1. Branch lines may not be used to brace main lines.
  - 2. Transverse bracing shall be at 40 feet maximum, except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes
  - 3. Longitudinal bracing shall be at 80 feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity to resist both the seismic load and the additional force induced by expansion and contraction.
  - 4. A rigid piping system shall not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
  - 5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.
  - 6. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.
- D. Bracing of Ductwork:
  - 1. Hanger straps must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheetmetal screws.
  - 2. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.

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3. Walls, including gypsum board nonbearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.
  4. Unbraced ducts shall be installed with a 6-inch minimum clearance to vertical ceiling hanger wires.
- E. Suspended Equipment, Piping, and Ductwork Cable Method:
1. The cables shall be adjusted to a degree of slackness approved by the Structural Engineer.
  2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers shall be adjusted so that there is a maximum 1/4-inch clearance.

**3.5 FIELD QUALITY CONTROL**

- A. Installation Report: Isolation manufacturer's representative shall confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

**END OF SECTION**

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**SECTION 23 05 53**

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**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes: Identify valves, piping and equipment components of the mechanical systems to indicate their function and system served.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
  - 2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
  - 3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

**PART 2 - PRODUCTS**

2.1 VALVE IDENTIFICATION

- A. Valve Tags:
  - 1. General: Identify valves with metal tags, legends to be stamped or embossed. It shall indicate the function of the valve and its normal operating position; i.e.,  
56 HW (NUMBER AND CONTENT OF PIPE)  
ISOLATION (VALVE FUNCTION)  
NO (NORMAL OPERATION POSITION)
  - 2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
  - 3. Material: Use 0.050 or 0.064-inch brass tags.
  - 4. Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, "lamicoid" or equal. Form letters by exposing center ply.
- B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.



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**2.2 PIPING MARKERS**

- A. Acceptable Manufacturers:
  1. W.H. Brady, Seton, Marking Systems, Inc. (MSI).
  2. Other Manufacturers: Submit Substitution Request.
  
- B. Pipes shall be labeled with all-vinyl, self-sticking labels or letters. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters. The pipe markers shall be identified and color coded as follows with black directional arrows.

<b>HVAC SERVICE</b>	<b>BACKGROUND PIPE MARKER *</b>	<b>COLOR</b>
CHILLED WATER	"CHILLED WATER SUPPLY"	GREEN
	"CHILLED WATER RETURN"	GREEN
HEATING WATER	"HEATING WATER SUPPLY"	YELLOW OR GREEN
	"HEATING WATER RETURN"	YELLOW

\* Directional arrow applied adjacent to pipe marker indicating direction of flow.

**2.3 EQUIPMENT IDENTIFICATION**

- A. Nameplates:
  1. Tag all pumps, air handling supply units, fans, terminal units, converters, and miscellaneous items of mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
  2. Identify unit with equipment tag as shown on Drawings and area served.
  
- B. Equipment Nameplate Directory: List pumps, air handlers, terminal units, and other equipment nameplates. Include Owner and Contractor furnished equipment. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

**PART 3 - EXECUTION**

**3.1 VALVE IDENTIFICATION**

- A. Valve Tags:
  1. Attach to valve with a brass chain.
  2. Valve tag numbers shall be continuous throughout the building for each system.
  
- B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

**3.2 PIPING MARKERS**

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- A. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
  - 1. Every 20 feet along continuous exposed lines.
  - 2. Every 10 feet along continuous concealed lines.
  - 3. Adjacent to each valve and stubout for future.
  - 4. Where pipe passes through a wall, into and out of concealed spaces.
  - 5. On each riser.
  - 6. On each leg of a "T".
  - 7. Locate conspicuously where visible.
  
- B. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

**3.3 EQUIPMENT IDENTIFICATION**

- A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.
  
- B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

**END OF SECTION**

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**SECTION 23 05 90**

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**PRESSURE TESTING FOR HVAC SYSTEMS**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes: Pressure testing of piping and ductwork systems.

**1.3 QUALITY ASSURANCE**

- A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.
- B. Owner Witness: Perform all tests in the presence of the Owner's representative.
- C. Engineer Witness: The Engineer or Engineer's representative reserves the right to observe all tests or selected tests to assure compliance with the specifications.
- D. Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's representative and the Engineer's representative need not occur simultaneously.

**1.4 SUBMITTALS**

- A. Submit the following:
  - 1. Test Reports:
    - a. Submit certificate of completion, inspection and test by authority having jurisdiction on required piping systems.
    - b. Submit certificate of test approval by Owner's representative on all systems.
    - c. For ductwork testing, submit the Test Report. Test Report shall contain description of the testing procedure and results, including recommendation for any remedial actions needed. The Engineer's representative will record witnessed tests.

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**PART 2 - PRODUCTS – NOT APPLICABLE**

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Piping: Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties. Conduct tests with all valves but those used to isolate the test section 10% closed.
- B. Ductwork: Test prior to connection to equipment and before applying insulation.
- C. Leaks: Repair all leaks and retest until stipulated results are achieved.
- D. Notification: Advise the Construction Manager 72 hours in advance of each test. Failure to so notify will require test to be rescheduled.
- E. Testing Equipment: Provide all necessary pumps, gauges, connections and similar items required to perform the tests.

**3.2 TESTING REQUIREMENTS**

- A. Low Pressure Ductwork:
  - 1. Test all ductwork systems at 2-inch static pressure, using a Pacific Air Products "Port-O-Lab" or "Rolok", or a McGill Airflow "LEAK DETECTIVE" testing machine or approved equivalent.
  - 2. All ductwork testing shall be conducted in accordance with latest published version of the SMACNA "HVAC Air Duct Leakage Test Manual".
  - 3. Prior to testing verify that all low pressure ductwork has been sealed to meet the SMACNA Seal Class C. for all joints.
  - 4. Low pressure ductwork leakage shall be less than or meet the requirement of the following SMACNA Leakage Classes:
    - a. Rectangular Metal – Class 24
    - b. Round or Flat Oval – Class 12
  - 5. Maximum allowable leakage is defined as Cubic Feet per Minute (CFM) air leakage per 100 square feet SURFACE AREA of duct section tested.
  - 6. All low pressure ductworks shall be tested.
- B. Piping - General: Test all piping as noted below, with no leaks or loss in pressure for time indicated. Repair or replace defective piping until tests are completed successfully:

<b>HVAC Systems</b>	<b>Test Pressure</b>	<b>Test Medium</b>	<b>Test Duration</b>
Chilled water	150 psig	Water	4 hours
Heating water	150 psig	Water	4 hours
Radiant water	150 psig	Water	4 hours
PEX	100 psig	Water	4 Hours

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**END OF SECTION**

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**SECTION 23 05 93**

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**TESTING, ADJUSTING AND BALANCING**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes:
  - 1. Testing and balancing of air systems.
  - 2. Testing and balancing of hydronic systems.
  - 3. Testing and balancing of miscellaneous mechanical equipment.
- B. Related Sections include:
  - 1. Section 23 0900 Instrumentation and Controls for HVAC.

**1.3 QUALITY ASSURANCE**

- A. Testing and Balancing Firm Qualifications:
  - 1. The Contractor shall procure the services of an independent balance and testing agency, approved by the Architect, which specializes in the balancing and testing of plumbing, heating, ventilating, and air conditioning systems, to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems as herein specified.
  - 2. The testing agency shall provide proof of having successfully completed at least five projects of similar size and scope. Testing and balancing work shall be done under direct supervision of registered professional engineer who has been employed by the Agency a minimum of one year prior to start of project.
- B. Industrial Standards: Testing and Balancing shall conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:
  - 1. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
  - 2. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
  - 3. ANSI:
    - a. S1.4 Specifications for sound level meters.

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- b. S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
  - C. Instrument Certification: All instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.
  - D. Test Observation: If requested, the tests shall be conducted in the presence of the Architect or the Architect's representative.
  - E. Pre-Balancing Conference: Prior to starting balancing, general techniques shall be reviewed with the Engineer. This conference must occur prior to measuring existing conditions. Measuring of existing conditions must occur prior to any demolition or new work. The conference will review existing conditions and systems to be affected by the project
- 1.4 SUBMITTALS
- A. Submit the following:
    - 1. Balancing Log: Include all air and water outlets, actual field measured air and water volume, and percentage of design volumes. Provide drawings identifying location of all outlets.
    - 2. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
    - 3. Additional Data: Submit all additional data as provided by Associated Air Balance Council (AABC) Standard forms.
    - 4. Number of Copies: Submit six (6) copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
    - 5. Instrument Certification: When requested, submit certificate of calibration for all equipment to be used.
  - B. Record data on NEBB forms or forms approved by the Architect.

1.5 PROJECT CONDITIONS

- A. Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Submit preliminary report indicating existing conditions prior to making any modifications to existing systems. Adjust central equipment as required and restore all unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.
- B. Do not perform final testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and operating continuously as required.
- C. Conduct air testing and balancing with clean filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

1.6 WARRANTIES

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- A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

**PART 2 - PRODUCTS – NOT APPLICABLE**

**PART 3 - EXECUTION**

**3.1 AIR SYSTEMS**

- A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.
- B. Preliminary:
1. Identify and list size, type, and manufacture of all equipment to be tested including air outlets and inlets.
  2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.
- C. Central System:
1. Adjust fan speeds and motor drives for required air volume within  $\pm 5\%$  maximum. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
  2. Adjust all automatic dampers, outside air, return air, and exhaust dampers for design conditions.
  3. Read static air pressure conditions on all air handling equipment including filter and coil pressure drops and total pressure across the fan. A Dwyer Series 400 air velocity meter only shall be used for final static pressures at equipment and where critical readings are required.
  4. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
  5. Read and record motor data and amperage draw.
- D. Distribution:
1. Read and adjust all air outlets to design air volumes within  $\pm 10\%$  maximum. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.
  2. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions. Generally, the building shall be balanced to be slightly positive to outdoors.
  3. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
  4. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.
  5. Mark all balancing dampers.



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**3.2 HYDRONIC SYSTEMS**

- A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.
- B. Preliminary:
  - 1. List complete data of tested equipment and verify against Contract Documents.
  - 2. For each pump:
    - a. Verify rotation.
    - b. Test and record pump shut-off head.
    - c. Test and record pump wide-open head.
  - 3. Verify proper system pressures.
  - 4. Verify air vents in high points of water are properly installed and operating freely.
- C. Central Equipment:
  - 1. Check conditions at all primary source equipment for performance of design conditions.
  - 2. Read and record pump heads, motor data, and amperage draw.
- D. Distribution:
  - 1. Read and adjust water flow for design conditions.
  - 2. Set all memory stops and mark position of adjuster on balancing valves.

**3.3 AUTOMATIC CONTROL SYSTEM**

- A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.
- B. Testing organization shall verify all controls for proper calibration and list controls requiring adjustment by control system installer.

**3.4 COORDINATION**

- A. Coordinate work with other trades to ensure rapid completion of the project.
- B. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Architect to allow corrective action to proceed.
- C. Periodic review of progress shall be provided as requested.

END OF SECTION

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**SECTION 23 07 00**

**INSULATION FOR HVAC**

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**PART 1 - GENERAL**

- A. RELATED DOCUMENTS
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- C. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- D. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes: Insulation for piping, ductwork (external), ductwork (internal), and equipment.
- B. Related Sections include:
  - 1. Section 23 0529 Hangers, Supports and Anchors for HVAC.
  - 2. Section 23 3101 HVAC Ducts and Casing – Low Pressure.
  - 3. Section 23 3102 HVAC Ducts and Casing – Medium Pressure.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723.
  - 2. Energy Codes: Local Building and Energy Codes shall govern where insulation performance requirements for thickness exceeds thickness specified.
- B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.
- C. Source Quality Control:
  - 1. Service: Use insulation specifically manufactured for service specified.
  - 2. Labeling: Insulation labeled or stamped with brand name and number.
  - 3. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, shall not react corrosively with equipment, piping, or ductwork, and shall be asbestos free.

**1.4 SUBMITTALS**

- A. Submit the following.
  - 1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

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**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Equivalent products by Johns Manville, Knauf, Owens Corning, and CertainTeed are acceptable.
- B. All such insulation shall be of one manufacturer.
- C. Other Manufacturers: Submit Substitution Request.

**2.2 PIPE INSULATION**

- A. Pre-formed mineral wool: Mineral wool insulation made from basalt, volcanic rock, and bound with thermosetting resin; ASTM C447; ASTM C547; ASTM C585; ASTM C795; ASTM E84; ASTM C1335; ASTM C1338; UL 723. Johns ManSville MINWOOL-1200 or equal.

**2.3 DUCTWORK BLANKET INSULATION**

- A. Fiberglass: 1.0 pcf nominal density, 0.25 per inch maximum K-factor at 75°F mean temperature, 250°F minimum operating temperature limit. Johns Manville Microlite Type 100 with facing as follows:
  - 1. Exposed: FSK facing (foil scrim Kraft).
  - 2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
  - 3. Concealed without Vapor Barrier: Facing not required.
- B. Semi-Rigid Fiberglass: 2.5 pcf nominal density, 0.24 per inch maximum K-factor, at 75°F mean temperature, 250°F minimum operating temperature limit. Johns Manville Micro-Flex with facing as follows:
  - 1. Exposed: FSK facing (foil scrim kraft) or vinyl-white appearance.
  - 2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
  - 3. Concealed without Vapor Barrier: Facing not required.

**2.4 DUCTWORK BOARD INSULATION**

- A. Semi-Rigid Fiberglass: 0.23 per inch maximum K-factor at 75°F mean temperature, 250°F minimum operating temperature limit and all purpose vapor barrier facing with white Kraft paper finish. Micro-Aire Duct Board Type LP.
- B. Rigid Fiberglass: Same as semi-rigid except with 4.0 pcf density and 0.23 per inch maximum K-factor. Johns Manville Diffuser Board.

**2.5 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP**

- A. Barrier shall be constructed of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side. The barrier shall have a nominal density of 1 lb per square foot and minimum STC rating of 28. The barrier shall have a minimum thermal conductivity value of 0.29 and a rated service temperature range of -40 degrees F. to 220 degree F. Barrier shall have a flame spread index of no more than 10 and a smoke development index of less than 40.

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- B. The decoupling layer shall be a combination of 1-inch fiberglass batting, non woven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern which encapsulates the glass fibers. The composite material shall be fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints.
- C. Kinectics Noise Control model KNM-100ALQ.

**2.6 ACCESSORIES PIPING**

- A. Adhesives:
  - 1. Fiberglass: Zeston Z-Glu.
- B. Cements:
  - 1. Insulating: Ryder.
  - 2. Heat Transfer: Zeston Z-20.
- C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
- D. Pipe Fitting Covers: One piece aluminum insulated pipe fitting covers.
- E. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.
- F. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150°F. Zeston Z-tape.
- G. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the aluminum facing, Kraft paper, tapes and adhesives.

**2.7 ACCESSORIES DUCTWORK**

- A. Adhesives:
  - 1. Fiberglass: Zeston Z-Glu.
- B. Weld Pins: Duro-Dyne with NC-1 nylon stop clips.
- C. Cements:
  - 1. Insulating: Ryder.
  - 2. Heat Transfer: Zeston Z-20.
- D. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
- E. Mastic: Chicago Mastic:
  - 1. Vapor Barrier: 17-475.
  - 2. Outdoor Mastic: 16-110 white.
- F. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150°F. Zeston Z-tape.
- G. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the aluminum facing, Kraft paper, tapes and adhesives.

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**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Workmanship:
  - 1. Installation: Insulation installed in first class, neat professional manner.
  - 2. Applicators: Applicators shall be employed by firm that specializes in insulation work.
- B. Preparation: Surfaces of piping, ductwork and equipment clean, free of oil or dirt, and dry before insulation is applied.
- C. Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

**3.2 HVAC PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS**

- A. Insulation Applied Locations – HVAC Piping:

<b>System</b>	<b>Pipe Size</b>	<b>Insulation Type</b>	<b>Insulation Thickness</b>	<b>Notes</b>
<b>Heating Water (to 250°F)</b>	1 1/4-inch and smaller	Mineral Wool	2-inch	Note 1
	1 1/2-inch to 6-inch	Mineral Wool	2 1/2-inch	Note 1
<b>Chilled Water</b>	1-inch and smaller	Mineral Wool	1-inch	
	1 1/4-inch to 6-inch	Mineral Wool	1 1/2-inch	Note 1
Note 1: Cover with metal pipe jacket where exposed to weather.				

- B. Piping insulation is not required between the control valve and coil on run-outs when the control valve is located within 4 feet of the coils and the pipe size is 1-inch or less.
- C. Valves, humidifier bodies and irregular fittings shall be insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36 lagging adhesive. The contractor shall have the option on all flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge S.S. lacing wire.
- D. Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

**3.3 PIPING INSTALLATION**

- A. General:

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1. Joints: Coat both sides of complete joining area with applicable adhesive.
    - a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
    - b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
    - c. Multiple Layered Insulation: Joints staggered.
  2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
  3. Voids: Fill all voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
  4. Seal joints, seams and fittings of metal watertight jackets at exterior locations.
- B. Fiberglass Insulation: Exterior insulation encased in metal jacket.
- C. Mineral Wool Insulation (pre-insulated piping):
1. Install per manufacturer's instructions.
  2. All insulation and jacket shall be factory applied to the carrier piping and fittings.
  3. Sectional insulation shall be banded on pipe with stainless steel banding on 18 centers.
  4. Installation shall be liquid and vapor tight.
- D. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
1. Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.
- E. Unions, Mechanical Joints, Valves, Etc.:
1. General:
    - a. As specified for fittings.
    - b. Minimum thickness same as specified for piping.
  2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
  3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
  4. Flanged Valves: Insulation with square corners.
- F. Vapor Barrier Insulation:
1. Refer to Section 23 05 29 for support requirements.
  2. Piping which requires vapor barrier protection shall have a continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
    - a. Chilled water including radiant cooling water.
  3. Vapor Barrier Insulation.
    - a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
    - b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 23 0529.
- G. Non-Vapor Barrier Insulation:
1. Refer to Section 23 0529 for support requirements.

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2. For pipe 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
3. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation. Provide pipe shield specified in Section 23 0529.

**3.4 EQUIPMENT INSTALLATION**

- A. General: Install true and smooth. Insulation over curved surfaces shall conform to curves of surface.
1. Access: Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance shall be provided with covers or section that are easily removable and replaceable. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
  2. Voids, Depressions and Cavities: All voids, chipped corners and other openings shall be filled with insulating cement or material compatible with insulating material.
  3. Vapor Barriered Insulation: Where insulation is specified to have a vapor barrier, the barrier shall not be pierced or broken.
    - a. Tears, etc., shall be coated with vapor barrier mastic and patched with insulation facing or tape.
    - b. Staples brush coated with vapor barrier coating.
    - c. All raw edges coated with vapor barrier mastic shall be covered and cover shall be sealed to equipment surface.
  4. Non-Vapor Barriered Insulation:
    - a. Tears, etc., shall be patched with insulation facing or tape.
    - b. All raw edges shall be covered and neatly beveled to the equipment surface.
  5. Multilayered Insulation: With staggered joints.

**3.5 DUCT INSULATION APPLIED LOCATIONS**

- A. General:
1. All external insulation with continuous vapor barriers unless specifically noted otherwise.
  2. Internally lined shall be lined completely to grille or diffuser or to indicated terminal points. Dimension shown are net inside of liner.
  3. Internally lined ductwork need not be externally insulated.
  4. In addition to locations described in specification, internally line medium, low, return and exhaust air ductwork where shown on drawings.

B. Insulation Applied Location – HVAC Ductwork:

<b>System</b>	<b>Location</b>	<b>Duct Type</b>	<b>Insulation Type</b>	<b>Thickness</b>	<b>Notes</b>
<b>Low Pressure Supply*</b>	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1 1/2-inch	
		Round	Internally Lined	1 1/2-inch	Note 1

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<b>System</b>	<b>Location</b>	<b>Duct Type</b>	<b>Insulation Type</b>	<b>Thickness</b>	<b>Notes</b>
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1 1/2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	3-inch	Note 1
	Under Slab Ductwork	All	Internally Lined	2-inch	
	Downstream of Air Terminal Units	All	Internally Lined	1-inch	Note 1
	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 1
<b>Return Air* (Not insulated except:)</b>	Concealed Outside Building Envelope	All	Externally insulated without vapor barrier	2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	2-inch	Note 1
	Under Slab Ductwork	All	Internally Lined	2-inch	Note 1
	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 1
<b>Exhaust Air* (Not insulated except:)</b>	15 ft upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 1
	In Toilet Rooms, 10 ft downstream of exhaust grilles	All	Internally Lined	1-inch	Note 1
<b>Outside Air</b>	Exposed or Visible	Rectangular	Internally Lined	2-inch	



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<b>System</b>	<b>Location</b>	<b>Duct Type</b>	<b>Insulation Type</b>	<b>Thickness</b>	<b>Notes</b>
<b>(Untempered)</b>	(Including above a cloud ceiling)	Round	Internally Lined	2-inch	Note 1
	Concealed or in mechanical rooms	All	Fiberglass Blanket	2-inch	

\* In addition to applied locations listed in this table, provide internally lined ductwork where indicated on Note 1: Where round or oval ductwork is indicated, provide double walled round/oval ductwork as specified in 23 3102, or provide internally lined rectangular ductwork with equivalent free area.

**3.6 DUCTWORK INSTALLATION**

**A. General:**

1. Install in accordance with manufacturer's instruction.
2. The vapor barrier shall be continuous. Tears, holes, staples, etc. shall be coated with vapor barrier mastic and patch with facing or tape. Joints between insulation and access with vapor barrier mastic.
3. Insulation at access panels to be removable or attached to panel with edges of panel and opening reinforced with metal beading.

**B. External Blanket Insulation:**

1. Insulation secured to ductwork with 20-gauge snap wires 24 inches on center and at all joints.
2. Joints and seams lapped a minimum of 3 inches and sealed with jacket tape.

**C. Board Insulation:**

1. Rectangular ducts with weld pins spaced a maximum of 18 inches on center in both directions.
2. All corners made with joints, bending insulation around corners not allowed.
3. All joints and seams butted tight together.
4. Butt joints with 3-inch wide tape.
5. Corners finished with 3-inch wide tape.

**D. Volume Dampers:** Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep and finish edges to maintain vapor barrier and to prevent damage to the insulation.

**3.7 DUCT AND PIPE ACOUSTICAL WRAP**

**A. Installed in accordance with the manufacturer's instructions.**

**B. Applied locations for piping and duct systems:**

1. Where specified or indicated on drawings.

**3.8 FIELD QUALITY CONTROL**

**A. Field Test:** All systems shall be tested and approved prior to installation of insulation.

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**END OF SECTION**

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**SECTION 23 09 00**

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**INSTRUMENTATION AND CONTROLS FOR HVAC**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes: Provide complete automatic control system.
- B. Related Sections include:
  - 1. Section 23 2113 Pipe and Pipe Fittings HVAC.
  - 2. Section 23 0593 Testing, Adjusting and Balancing.

1.3 QUALITY ASSURANCE

- A. Control work shall be provided by single company with specialists in the type of work required, so that only one control manufacturer is responsible for all control and automation work for project.
- B. Provide coordination with other contractors or subcontractors for work required by other trades for accomplishment of control work.
- C. Prior to substantial completion, controls contractor must demonstrate to Owner that system is operating per the Specifications and final adjustments have been made as approved.
- D. System, including all components and appurtenances, shall be configured and installed to yield a Mean Time Between Failure (MTBF) of at least 1,000 hours.

1.4 SUBMITTALS

- A. Equipment Data: The submittals shall include complete data for all materials, including field and system equipment.

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- B. Operation and Maintenance Manuals: Provide one complete manual in PDF format within 30 days after completing acceptance tests. Identify each manual's contents on cover. Manuals shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of nearest service representatives for each item of equipment and each system. Place tab sheets at beginning of each chapter or section and at beginning of each appendix. Final copies delivered after completion of the acceptance tests shall include all modifications made during installation, checkout, and acceptance. Operation and Maintenance Manuals to include hardware manual, software manual, operations manual, and maintenance manual.
1. Hardware Manual: Furnish a hardware manual describing all equipment provided, including:
    - a. General description and specifications.
    - b. Installation and checkout procedures.
    - c. Equipment electrical schematics and layout drawings.
    - d. System schematics and I-O wiring lists.
    - e. Alignment and calibration procedures.
  2. Operator's Manual: The operator's manual shall provide all procedures and instructions for operation of the system, including:
    - a. System start-up and shutdown procedures.
    - b. Alarm presentation.
    - c. Recovery and restart procedures.
    - d. Report generation.
    - e. Provide one Operator's Manual per Operator's Terminal.
  3. Maintenance Manual: The maintenance manual shall provide descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
  4. Acceptance Test Forms: Maintenance manual shall include copies of signed-off acceptance test forms.

1.5 ACCEPTANCE TESTING AND TRAINING

- A. Site Testing:
1. General: Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's representative will witness and sign off on acceptance testing.
  2. Acceptance Test: Contractor shall demonstrate compliance of completed control system with contract documents. Using approved test plan, all physical and functional requirements of project shall be demonstrated.
- B. Training:

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1. General: Contractor shall conduct training courses for designated personnel in operation and maintenance of system. Training shall be oriented to specific system being installed under this contract. Training manuals shall be provided for each trainee, with two additional copies provided for archival at project site. Manuals shall include detailed description of the subject matter for each lesson. Copies of audiovisuals shall be delivered to Owner. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility. Notification of any planned training shall be given to the Owner's representative at least 15 days prior to the training.

**PART 2 - PRODUCTS**

2.1 CONTROL DEVICES

A. Temperature Instruments:

1. Room Temperature Sensors: Platinum RTD type with accuracy of  $\pm 0.4^{\circ}\text{F}$  at  $70^{\circ}\text{F}$ ; operating range  $30\text{-}120^{\circ}\text{F}$ ; linear to DDC system; single point sensing element in wall-mounted ventilated enclosure with insulating backplate if mounted on exterior wall.
  - a. Sensor shall have digital readout display.
2. Duct Temperature Sensors: Platinum RTD element with accuracy of  $\pm 0.5^{\circ}\text{F}$  at  $32^{\circ}\text{F}$ , averaging type consisting of array of single point sensing elements, securely mounted in duct or plenum; operating range  $0\text{-}100^{\circ}\text{F}$ ; linear signal; 20-foot element.
3. Outside Air Temperature Sensor: Platinum RTD element with accuracy of  $\pm 0.5^{\circ}\text{F}$  at  $32^{\circ}\text{F}$ ; Range  $-60$  to  $100^{\circ}\text{F}$ , single element, linear, with weather and sun shield for exterior mounting.
4. Low Temperature Limit Thermostat: Minimum 20 foot capillary sensing element, triggering on low temperature as sensed by any 6-inch segment; snap acting, normally open contacts, manual reset, line voltage.
5. Liquid Immersion Temperature Sensor: Platinum RTD element, with accuracy of  $\pm 0.5^{\circ}\text{F}$  at  $32^{\circ}\text{F}$ , stainless steel well and assembly, range  $40\text{-}240^{\circ}\text{F}$ .

- B. Motorized Valves: Equip with equal percentage with tight shutoff. Two position valves shall be line size (two position ball valves shall be full port), modulating water valves shall be sized at 5 psi drop or as shown on the Drawing. Screwed ends except 2-1/2-inch and larger valves with flanged ends. Select valves to modulate smoothly at all system pressures and flows. Select valves with close-off ratings and spring ranges designed to operate at the maximum flows and maximum available pump heads scheduled without leakage. Bubble tight butterfly valves acceptable on 2-1/2-inch lines and above for two-position action only. Air handling unit heating and cooling coil valves shall be sized for 5 psi drop, unless otherwise noted on drawings.

- C. Valve and Damper Operators:

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1. Electronic modulating actuators with low voltage DC or current positioning signal. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator. Modulating actuators shall be provided and shall accept 0-10 VDC or 2-10 VDC or 4-20 mA input signal. Actuators shall provide the minimum torque required for proper close-off against the system pressure for the required application. The spring return feature shall permit normally open or normally closed positions of the valve or damper. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction. Actuators shall be powered by 24 VAC.
  
- D. Flow Switches: Provide McDonnell Miller or approved equal. Install in piping in such a manner so as to eliminate nuisance fluttering. Provide time delay relays where required to eliminate false alarms when equipment is started. Differential pressure type. Current switches set for pump or fan normal current range are acceptable.
  
- E. Carbon Dioxide Sensor: Infrared sensing, Carbon Dioxide gas monitor. Based on Airtest TR9290 series.

Detection Range:	0-2000ppm
Accuracy:	+/- 3% of measured value
Response Time:	2 minutes
Outputs:	0-10V, 4-20mA
Calibration:	Self calibrating, calibration not required
Power Requirement:	24 VAC/VDC $\pm$ 20%, 50-60Hz (half-wave rectified)
Operating Temperature Range:	32°F to 122°F
Operating Humidity Range:	0% - 95% RH, Non-Condensing
Display:	Sensor shall be provided with digital display.

**PART 3 - EXECUTION**

3.1 INSTALLATION

1. All power wiring to be installed in conduit.
  2. Grounding: Instrumentation and communication grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
  3. Control voltage shall be limited to maximum of 120 volts.
  4. Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit shall be properly fused with fuse block located in respective starter enclosure.
  5. Where relays are used to control single phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.
- 
- B. Identification: Provide engraved nameplates identifying all switches, lights and starters, and each control device where control function is not readily apparent.

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- C. Room Thermostats and Room Sensors: Mount at height of 4 feet for wall mounted sensor and thermostats with adjustment on face. Mount at height of 5 feet for all wall mounted thermostats and sensors which do not have adjustment on face. Provide insulating back on thermostats mounted on exterior walls. Provide one thermostat for each zone of temperature control. Submit proposed locations for approval prior to preparing control drawings, where not shown or alternate location is proposed.
  
- D. Carbon Dioxide Sensor:
  - 1. Mount sensor at 5 feet above finished floor or as indicated on the plans.
  - 2. Provide sensor quantity as indicated on plans or as required by sensor coverage rating (max. 20-foot radius).
  - 3. Alarm above 850 PPM.
  - 4. Refer to sequence of operations for more information on sensor use.

END OF SECTION

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**SECTION 23 09 10**

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**INSTRUMENTATION AND CONTROLS FOR AUTOMATED WINDOWS**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. Operable windows shall be provided at exterior walls where shown on Drawings. These windows shall function together as a component of a passive ventilation system. Such designated windows at exterior walls shall be mechanically controlled and operated. Each mechanically operable window shall be controlled by a central control system connected to all mechanically operable windows for that space. This control will engage the HVAC system when windows are closed, and disengage the HVAC system when the windows are open. It shall engage the HVAC system through a contact provided to one single window at each space. See Electrical and Mechanical Drawings for more information regarding equipment and wiring.

1.3 QUALITY ASSURANCE

- A. Control work shall be provided by single company with specialists in the type of work required, so that only one control manufacturer is responsible for all control and automation work for project.
- B. Provide coordination with other contractors or subcontractors for work required by other trades for accomplishment of control work.
- C. Prior to substantial completion, controls contractor must demonstrate to Owner that system is operating per the Specifications and final adjustments have been made as approved.
- D. System, including all components and appurtenances, shall be configured and installed to yield a Mean Time Between Failure (MTBF) of at least 1,000 hours.

1.4 SUBMITTALS

- A. Equipment Data: The submittals shall include complete data for all materials, including field and system equipment.



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- B. Operation and Maintenance Manuals: Provide one complete manual in PDF format within 30 days after completing acceptance tests. Identify each manual's contents on cover. Manuals shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of nearest service representatives for each item of equipment and each system. Place tab sheets at beginning of each chapter or section and at beginning of each appendix. Final copies delivered after completion of the acceptance tests shall include all modifications made during installation, checkout, and acceptance. Operation and Maintenance Manuals to include hardware manual, software manual, operations manual, and maintenance manual.
1. Hardware Manual: Furnish a hardware manual describing all equipment provided, including:
    - a. General description and specifications.
    - b. Installation and checkout procedures.
    - c. Equipment electrical schematics and layout drawings.
    - d. System schematics and I-O wiring lists.
    - e. Alignment and calibration procedures.
  2. Operator's Manual: The operator's manual shall provide all procedures and instructions for operation of the system, including:
    - a. System start-up and shutdown procedures.
    - b. Alarm presentation.
    - c. Recovery and restart procedures.
    - d. Report generation.
    - e. Provide one Operator's Manual per Operator's Terminal.
  3. Maintenance Manual: The maintenance manual shall provide descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
  4. Acceptance Test Forms: Maintenance manual shall include copies of signed-off acceptance test forms.

1.5 ACCEPTANCE TESTING AND TRAINING

- A. Site Testing:
1. General: Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's representative will witness and sign off on acceptance testing.
  2. Acceptance Test: Contractor shall demonstrate compliance of completed control system with contract documents. Using approved test plan, all physical and functional requirements of project shall be demonstrated.
- B. Training:

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1. General: Contractor shall conduct training courses for designated personnel in operation and maintenance of system. Training shall be oriented to specific system being installed under this contract. Training manuals shall be provided for each trainee, with two additional copies provided for archival at project site. Manuals shall include detailed description of the subject matter for each lesson. Copies of audiovisuals shall be delivered to Owner. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility. Notification of any planned training shall be given to the Owner's representative at least 15 days prior to the training.

**PART 2 - PRODUCTS**

2.1 MANUFACTURER'S

- A. Basis of Design: Automated Fenestration Inc. [www.automatedfenestration.com](http://www.automatedfenestration.com)
- B. Substitutions: Or equal, Refer to Division 1 for substitution requirements

2.2 WINDOW ACTUATOR

- A. Model CDC-1-ACB UL
  1. ACB chain drive 24 V
  2. 250 N / 13.77" (...) // (350/500/600/(...)/1300 mm) stroke
  3. Can be used for openings for smoke exhaust; D+H Euro SHEV in accordance with EN 12101-2; and for daily ventilation.
  4. With BSY+ motor and synchronized electronics controlled via microprocessor.
  5. Perfectly suited for profile integrated and surface mounted installation.
  6. Low running noises thanks to the innovative acoustic decoupling of the drive components.
  7. Universal bracket sets for installation of all commonly available profile systems.
  8. Flexible overall lengths for customized strokes
  9. Available in all RAL colors
  10. Can be used for virtually all window opening types thanks to the left and right drive
  11. Integrated ACB (Advanced Communication Bus) bus interface with Modbus RTU protocol
  12. The drive is integrated directly via open bus communication through the ACB (Advanced Communication Bus), e.g., in a building management system.

B. Technical Data: CDC-0252-0350-1-ACB

Operating voltage:	24 V DC / ±15 %
Current consumption:	0.6 A
Duty cycle:	30 %
	(ON: 3 min. / OFF: 7 min.)
Force of pressure:	250 N (45lbf)
Tensile force:	250 N (45lbf)
Nominal locking force:	1500 N (449.6 lbf) (excluding brackets)

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Service life:	20000 double strokes
Stroke length:	350-1300 mm (13.77"- 51.18")
OPEN running speed:	6.7 mm/s
OPEN running speed – SHEV:	9.4 mm/s
CLOSED running speed:	5 mm/s
Type of protection:	IP 32
Emission sound pressure level:	LpA ≤ 35 dB(A)
Temperature range:	-5 °C ... +75 °C (+23°F...+167°F)
Housing:	Aluminum
Surface:	Powder-coated
Color:	White aluminum (~ RAL 9006)
Connection :	2.5 m Silicon cable
Dimensions (WxHxD):	405 x 30 x 39 mm
Certification:	UL325

- C. Control Panel: Automated Fenestration – Relay Station (RS4;RS2)
1. Powered control panels for 24VDC actuators
  2. DIN rail mounted 120VAC/24VDC power supply
  3. Quick connect input terminals
  4. One-touch open/close control
  5. Two-year manufacturer’s warranty.
  6. Requires reading AFI Install Guide before purchase, and confirmation of project and installation specs by licensed electrical contractor.
- D. Window actuator controllers can be manufactured to have:
1. Power output from 30W up to 400W.
  2. 1 to 4 command modules.
  3. 1 general command module.

**PART 3 - EXECUTION**

3.1 INSTALLATION

1. All power wiring to be installed in conduit.
  2. Grounding: Instrumentation and communication grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
  3. Control voltage shall be limited to maximum of 120 volts.
  4. Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit shall be properly fused with fuse block located in respective starter enclosure.
  5. Where relays are used to control single phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.
- B. Identification: Provide engraved nameplates identifying all switches, lights and starters, and each control device where control function is not readily apparent.

END OF SECTION

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**SECTION 23 21 13**

**PIPE AND PIPE FITTINGS HVAC**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes: Furnish piping, pipe fittings, and incidental related items as required for complete piping systems, and treatment of HVAC water systems.
- B. Related Sections Include:
  - 1. Section 23 2500 HVAC Water Treatment.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Piping material and installation to meet requirements of the local building codes and serving utility requirements.
- B. All grooved joint couplings and fittings shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.
- C. Pipe Cleaning: Should any pipe be plugged or should foaming of water systems occur, disconnect piping, re-clean, and reconnect without additional expense to the Owner.
- D. Correct any damage to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

1.4 SUBMITTALS

- A. Submit the Following:
  - 1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
  - 2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.
  - 3. Certificate of completion

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- 4. Treatment Reports
- B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.
- C. Other: Make certified welders' certificates available.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. As indicated.

2.2 COPPER PIPE

- A. All copper pipe and fittings made in the USA and labeled as such.
- B. Pipe: Hard drawn copper tubing, Class L, ASTM B 88.
- C. Fittings:
  - 1. Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal.
- D. Service:
  - 1. Chilled and heating water piping (Type L, hard drawn) up to and including 4-inches.

2.3 UNIONS

- A. Solder type for copper tubing.
- B. Dielectric fittings shall be nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F-492. Fittings shall be suitable for the pressure and temperature to be encountered.

2.4 SOLDERING AND BRAZING

- A. Brazed Joints:
  - 1. Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.
  - 2. Applied locations:
    - a. All below grade piping.
    - b. All above grade piping larger than 2-inches for the following services: heating water, chilled water.
- B. Soldered Joints:
  - 1. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
  - 2. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.

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3. Applied locations: Above grade piping 2-inch and smaller for the following services: Heating water, chilled water.

C. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.

2.5 UTILITY MARKERS

A. Provide plastic tape utility markers over all buried piping. Provide identification on tape.

B. Material to be Brady Identoline plastic tape, 6-inch, Seton, or as approved.

2.6 PIPE WRAPPING

A. For all below ground steel piping and fittings, provide complete covering of Scotchrap No. 51, 20 mil thickness, protective tape applied over Scotchrap pipe primer applied at 1 gal/800 SF of pipe surface.

B. At Contractor's option as approved, pipe may be furnished with factory applied jacket of "X-tru-coat" with Scotchrap as previously specified for field joints.

2.7 RADIANT FLOOR HEATING PIPING

A. Approved Manufacturer: Uponor, Viega, or equal.

B. Description:

1. Tubing cross-linked polyethylene oxygen diffusion barrier tubing rated at 180°F maximum working temperature and 100 psi working pressure. Oxygen barrier shall conform to DIN 4726. The tubing shall be manufactured in accordance with ASTM F876 using the Engel method (PEX-A).
2. Fittings shall be manufactured of dezincification resistant brass with barbed insert, compression ring, and compression nut and shall be compatible with the tubing and shall not permit excessive oxygen permeation.

C. Service: Slab Heating and cooling

D. Three Victaulic flexible couplings may be used in lieu of a flexible connector for vibration attenuation and stress relief at equipment connections. The couplings shall be placed in close proximity to the vibration source.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. Measurements, Lines and Levels:

1. Check dimension at the building site and establish lines and levels for work specified in this Section.

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2. Establish all inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
3. Use established grid and area lines for locating trenches in relation to building and boundaries.

3.2 EXCAVATION AND BACKFILL

- A. General: Perform all necessary excavation and backfill required for the installation of mechanical work in accord with Division 2. Repair pipelines or other work damaged during excavation and backfilling.
- B. Excavation: Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps. Include additional excavation to facilitate utility crossovers, additional offsets, etc. Excavation material is unclassified. Width of trench shall be adequate for proper installation of piping. The trench shall be widened, if not wide enough for a proper installation.
- C. Bedding: All copper piping shall be full bedded on sand. Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose. Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length. Lay all other piping on a smooth level trench bottom so that contact is made for its entire length.
- D. Backfill: Place in layers not exceeding 8 inches deep and compact to 95% of standard proctor maximum density at optimum moisture content. Earth backfill shall be free of rocks over 2 inches in diameter and foreign matter. Disposal of excess material as directed.
  1. Interior: All backfill under interior slabs shall be bank sand or pea gravel.
  2. Exterior: Excavated material may be used outside of buildings at the Contractor's option. The first 4 inches shall be sand, and final 12-inch layer course shall be soil in any event.

3.3 PIPING INSTALLATION

- A. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
- B. Install all piping as to vent and drain. Install according to manufacturer's recommendations.
- C. Support all piping independently at apparatus so that its weight shall not be carried by the equipment.
- D. Run piping clear of tube cleaning or removal/replacement access area on coils, heat exchangers, chillers, etc.

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- E. Utility Marking: Installed over the entire length of the underground piping utilities. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12 inches above the top of utility.
- F. Underground Water System: Prior to testing pipe provide concrete thrust blocks at changes in direction. Block size as required for types of fittings involved.
- G. Dielectric Fittings: Provide dielectric couplings, unions, or flanges between dissimilar metals. In addition, provide dielectric couplings as required to isolate cathodically protected piping and equipment.

3.4 PIPING JOINTS

- A. Pipe and fittings shall be joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. shall be done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
- B. Copper Piping: Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished. Joint shall be uniformly heated, and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.
- C. No couplings installed in floor or wall sleeves.
- D. Flexible Couplings: Provide where indicated on the Drawings.

3.5 INSTALLATION, PIPE WRAP

- A. Apply per manufacturer's written instructions.
- B. Apply wrapping to fittings in field after installation.

3.6 ADJUSTING AND CLEANING

- A. General:
  - 1. Clean interior of all piping before installation.
  - 2. Flush sediment out of all piping systems after installation before connecting mechanical equipment to the piping.
  - 3. When placing the water systems in service during construction, each system shall be cleaned by circulating a solution with 1000 ppm of trisodium phosphate for 24 hours, then drained, flushed and placed in service.
  - 4. Clean all strainers prior to placing in service.

3.7 INSTALLATION, RADIANT FLOOR HEATING SYSTEM PIPING

- A. Install piping per manufacturer's recommendations.

END OF SECTION



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**SECTION 23 21 23**

**PUMPS FOR HVAC**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes:
  - 1. In-Line Circulating Pumps

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Product data for each pump including performance curves, pump efficiency, motor data, operating weights, and pressure ratings. Submit control information and wiring diagrams for packaged equipment.
  - 2. Operating and maintenance data for each product specified under this Section.

**PART 2 - PRODUCTS**

2.1 IN-LINE CIRCULATING PUMPS

- A. Acceptable Manufacturers:
  - 1. Grundfos.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description:
  - 1. Canned-rotor type high-efficiency circulator, controller integrated in control box, control panel with TFT display on the control box, built-in differential-pressure and temperature sensor, carbon fiber reinforced composite rotor can, stainless steel bearing plate and rotor cladding, aluminum alloy stator housing, air-cooled power electronics, single phase

**PART 3 - EXECUTION**

3.1 IN-LINE CIRCULATING PUMP INSTALLATION

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- A. Install pump in accordance with manufacturer's written installation instructions.
- B. Provide flexible connections, strainers, check valves and shutoff valves on suction and discharge as shown on Drawings.
- C. Lubricate in accordance with manufacturer's instructions before operation.
- D. Support and isolate circulators as specified and as scheduled on the Drawings.

END OF SECTION

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**SECTION 23 31 01**

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**HVAC DUCTS AND CASING-LOW PRESSURE**

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**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes: Low pressure ductwork and fittings.
- B. Related Sections include:
  - 1. Section 23 0548 Vibration and Seismic Controls for HVAC Piping Equipment.
  - 2. Section 23 0700 Insulation for HVAC.
  - 3. Section 23 3300 Air Duct Accessories.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.
- B. Regulatory Requirements:
  - 1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A.
  - 2. Ductwork and components shall be listed as U.L. 181, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

1.4 SUBMITTALS

- A. Submit the following:
  - 1. Provide catalog data on each product specified hereunder.
  - 2. Schedule of duct construction standards.
  - 3. Provide shop drawings showing materials and construction details for single wall housing plenum.
  - 4. Provide shop drawings showing construction details, support and seismic restraint of ductwork distribution systems.

**PART 2 - PRODUCTS**

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**2.1 SUPPORTS, ANCHORAGE AND RESTRAINTS**

- A. General:
1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for ductwork are not shown on the Drawings, the contractor shall be responsible for their design.
  2. Seismic restraints and anchorages shall resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
  3. Seismic restraints shall follow the provisions described in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment.
  4. Seismic restraints shall not introduce stresses in the ductwork caused by thermal expansion or contraction.
  5. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- B. Suspended Ductwork: Seismic restraints shall be in accordance with the latest edition of the SMACNA "Seismic Restraint Manual - Guidelines for Mechanical Systems" for the seismic hazard level corresponding to the seismic zone in which the project is constructed.
- C. Engineered Support Systems: The following support systems shall be designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction:
1. Supports and seismic restraints for suspended ductwork and equipment.
  2. Support frames for ductwork and equipment which provide support from below.
  3. Equipment and ductwork support frame anchorage to supporting slab or structure.

**2.2 SHEETMETAL DUCTWORK**

- A. Fabricate from galvanized steel, unless noted otherwise.
- B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers and supports shall be in accordance with SMACNA "HVAC Duct Construction Standards", Third Edition, 2005.
- C. Duct Classification: Ducts shall be considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2 inches W.G. positive or negative.
1. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch W.G. positive or negative.
    - a. Supply ductwork downstream from terminal units.
    - b. Supply, return or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch W.G.
    - c. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.
  2. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch W.G. positive or negative.
    - a. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1 inch W.G. On supply fans pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.

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- b. Supply, return, or exhaust ductwork serving multiple duct branches where contractor can demonstrate that pressures will not exceed 1 inch W.G. positive or negative.
- 3. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 2 inches W.G., positive or negative.
  - a. Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1 inch W.G. positive or negative.
- D. Longitudinal seams on rectangular duct shall be Pittsburgh or Button punch snap lock. Snap lock seams for round duct may be used only on ducts classified for 1/2 inch W.G. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1 inch W.G. or less.
- E. Joining and reinforcing systems manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA "J", and Ductmate 25 is equivalent to SMACNA "F".
- F. Use of adjustable round elbows not permitted.

### 2.3 FLEXIBLE DUCTS

- A. Acceptable Manufacturers:
  - 1. Thermaflex M-KE, Gen Flex IMP-25S.
  - 2. Other Manufacturers: Submit Substitution Request.
- B. Description: Flexible air duct with CPE or metal film liner permanently bonded to coated spring steel wire helix with 1-inch thick fiberglass insulation blanket covered with fiberglass reinforced metal film vapor barrier jacket. Duct rated for 6-inch W.G. positive and 1-inch W.G. negative.

### 2.4 EXPOSED OR VISIBLE DUCTWORK IN FINISHED SPACES

- A. Round:
  - 1. Material: Round or flat oval, machine formed, spiral lock-seam galvanized sheet metal ductwork of thicknesses as listed for sheet metal duct. Paintable surface.
  - 2. Fittings: Machine formed, shop fabricated, with welded seams, designed for easiest air flow, similar to United Sheetmetal numbers listed.
    - a. Mitered Elbow with Turning Vanes: Type EV-90-2.
    - b. Radius Elbows: Type E090-5. Similar for less than 90 degree elbows.
    - c. Tees: Type Con-T-1.
    - d. Reducing Fittings: May be used unless noted otherwise.
- B. Rectangular: Same as for sheet metal ductwork but paintable surface. All reinforcing shall be inside. Use special care to prevent imperfections in the metal surface.

## **PART 3 - EXECUTION**

### 3.1 APPLIED LOCATIONS

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- A. Supply ductwork on downstream side of terminal box. Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.
- B. Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 4'-0" length.
- C. Return Air Trunk Ductwork from End Run to Unit Connection: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.
- D. Exhaust Ductwork: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.
- E. Ductwork between Transfer Grilles: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00.
- F. Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, lined where indicated on the Drawings or as specified in Section 23 07 00.

**3.2 INSTALLATION**

- A. Ductwork:
  - 1. Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system.
  - 2. Low pressure ductwork hanger and support systems in accordance with SMACNA "HVAC Duct Construction Standards". Wire supports are not allowed.
  - 3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
  - 4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius shall have splitter vanes.
  - 5. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.
  - 6. Where pipe, structural member, or other obstruction passes through a duct, provide streamlined sheet metal collar around member and increase duct size to maintain net free area. Fit collar and caulk to make air tight.
- B. Dampers: Install where shown and where necessary to complete final balancing of system. Install regulators as specified in Section 23 33 00 for each specific project condition. Leave all dampers locked wide open in preparation for balancing.
- C. Flexible Connectors: Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork. Not required on internally spring isolated units.
- D. Flexible Ducts:
  - 1. Make connections at ends using draw band strap and a minimum of 2 wraps of duct tape.
  - 2. Suspend center spans from structure above using wire as required by code. Connect to manufacturer's eyelet on jacket or use 1-inch wide galvanized steel strap with single loop at top and smooth edges.
  - 3. Suspending duct by laying it on the ceiling is prohibited.

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4. Avoid crimping flex duct. All changes in direction shall be made using 2D radius. Duct connections to grilles, registers and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows or Thermaflex Flex Boots (or equal).

E. Ductwork, Exposed or Visible in Finished Areas:

1. Use extreme care in handling and installing.
2. Replace all dented or damaged sections.
3. Install ductwork straight and true, parallel to building lines.
4. Make all connections with pop rivets using couplings where applicable. Grind all raw edges smooth and apply paintable sealant to cover imperfections.
5. Remove all excess sealant to provide a finished joint.
6. Provide floor, wall, and ceiling plates as specified in Section 23 05 00.
7. Finish, clean and prime all ductwork and hangers for painting.

3.3 FIELD QUALITY CONTROL

A. Coordination with Balance Agency:

1. Provide services of a sheet metal person familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating all sheet metal dampers.
2. Install missing dampers required to complete final balancing.

**END OF SECTION**

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**SECTION 23 33 00**

**AIR DUCT ACCESSORIES**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 0500, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes: Medium and low pressure duct accessories, sealants and tapes, flexible connectors, fire dampers, smoke dampers, combination smoke and fire dampers, access doors, spin-in, extractors, automatic dampers, drain pans, eliminators, back draft dampers.
- B. Related Sections include:
  - 1. Section 23 31 01 HVAC Ducts and Casing-Low Pressure.
  - 2. Section 23 09 00 Instrumentation and Controls for HVAC.

**1.3 QUALITY ASSURANCE**

- A. Work performed by qualified, experienced mechanics in accordance with the manual of Duct and Sheet Metal Construction of the National Association of Sheet Metal and Air Conditioning Contractors and these Specifications.
- B. Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.
- C. Flexible connectors, flexible equipment connections, tapes and sealants listed as UL 181, Class I air duct. Flame spread rating not to exceed 25 and smoke developed rating not to exceed 50.

**1.4 SUBMITTALS**

- A. Submit the following: Product data for Duct Accessories.
  - 1. Low Pressure Duct Accessories:
    - a. Access Doors
    - b. Backdraft Dampers
    - c. Duct Sealer



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**PART 2 - PRODUCTS**

**2.1 LOW PRESSURE DUCT ACCESSORIES**

- A. Volume Damper Fabrication:
  - 1. Single blade dampers reinforced or crimped for rigidity, with pivot rod extending through duct. Dampers over 12 inches high use multiple opposed blade damper. Single blade damper no larger than 12 inches x 48 inches. Multiple blade damper factory fabricated, Ruskin MD-35 or equal.
  - 2. Minimum gauge and duct construction in accordance with SMACNA "HVAC Duct Construction Standards", latest edition.
  - 3. Splitter and butterfly dampers fabricated of 18 gauge galvanized steel.
  - 4. Dampers of length suitable to close branch ducts without damper flutter.
  - 5. Damper blade must be aligned with handle and index pointer.
  
- B. Flexible Equipment Connections: 30 oz. Ventfabrics Ventglas or Duro Dyne neoprene coated fire retardant glass fabric or approved equal.
  
- C. Duct Sealer:
  - 1. Based On: McGill Airseal Zero.
  - 2. Description: Suitable for indoor/outdoor use, rated to 10-inch WG, Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 30 g/L less water. SCAQMD Rule 1158 compliant.
  
- D. Duct Tape for Sheet Metal: ARNO C520 duct tape similar United, Duro Dyne, Nashua, Polymer Adhesive.
  
- E. Tape and Adhesive/Activator System for Sheet Metal: Hardcast, Polymer Adhesive.
  
- F. Access Doors:
  - 1. Manufacturer: Air Balance, Ruskin, Metco, Durodyne, Cesco, Nailor-Hart or approved equal.
  - 2. Doors complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch x 14-inch and larger), hinge and gasketing. Doors on insulated or lined ducts shall be insulated.
  - 3. Grease Duct Access Door: Construct of metal thickness equal to metal duct, doors air and grease tight with hinge and hand operable latches. Ductmate.
  - 4. Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8"	6" x 6"
9" to 12"	8" x 8"
13" to 20"	12" x 12"

- G. Backdraft Dampers:
  - 1. Manufacturer: Air Balance, Ruskin, Cesco, Advanced Air, Nailor-Hart or approved equal.
  - 2. Description: Gravity operated, vinyl edged, metal bladed backdraft dampers.

**PART 3 - EXECUTION**

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3.1 INSTALLATION

- A. Install all devices as shown on the Contract Drawings and per manufacturer's recommendations.
- B. Low Pressure Duct Accessory installation specified under Section 23 33 01.
- C. Access Doors: Install where indicated and at all duct mounted coils, humidifiers, automatic control dampers, smoke dampers, fire dampers, air flow stations, to provide access for cleaning and maintenance.
- D. Back Draft Dampers: Install where indicated and at the discharge (or inlet) of exhaust fans where automatic dampers are not indicated.

**END OF SECTION**

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**SECTION 23 37 00**

**AIR OUTLETS AND INLETS**

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**PART 1 - GENERAL**

**RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.
- C. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. This Section includes: Ceiling diffusers, sidewall grilles.
- B. Related Sections include:
  - 1. Section 23 33 00 Duct Accessories.

**1.3 SUBMITTALS**

- A. Submit the following:
  - 1. Shop Drawings: Showing dimensions and details of construction.
  - 2. Product Data.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Price, Titus, Krueger, Tuttle & Bailey, Anemostat, Nailor are acceptable.
- B. All such products shall be of one manufacturer.
- C. Other Manufacturers: Submit substitution Request.

**2.2 PERFORMANCE**

- A. Unit sizing is based on air being introduced at 20°F temperature differential and being diffused at the 5-foot level to a velocity not greater than 50 FPM and a temperature differential not greater than 1.5°F. Units are also selected so as not to exceed the NC-30 curve.

**2.3 DIFFUSERS AND GRILLES**

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- A. Refer to mechanical schedule for models and sizes.
- B. Color selected by architect.
- C. Ceiling Supply Diffuser (Plaque): Steel construction, standard 4-way flow
- D. Sidewall Supply Grille (Louvered): Steel construction, individually adjustable blades, wall mounted
- E. Sidewall Return/Exhaust Grille (Louvered): Steel construction, fixed blades, wall mounted
- F. Ceiling Return/Exhaust Diffuser (Perforated): Extruded aluminum border and mounting frame, steel perforated face and back pan

**PART 3 - EXECUTION**

3.1 INSTALLATION

- A. Install all diffusers tight to their respective mounting surfaces.
- B. Installed plumb and true with room dimensions and accurately centered on projections as shown on the Architectural reflected ceiling plans.
- C. Paint ductwork behind all outlets flat black.

**END OF SECTION**

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**SECTION 23 72 00**

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**AIR TO AIR ENERGY RECOVERY UNITS**

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**PART 1 - GENERAL**

1. RELATED DOCUMENTS

- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- C. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.
- D. Section 01 1813 Sustainable Design Requirements.

1.2 SUMMARY

- A. This Section includes: Heat recovery units.
- B. Related Sections include:
  - 1. Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment.
  - 2. Section 23 09 00 Instrumentation and Controls for HVAC.

1.3 SUBMITTALS

- A. Submit the following:
  - 1. Shop drawings showing details of construction, dimensions, arrangement of components, isolation, filters, etc.
  - 2. Product data showing performance data, standard items and accessories, operating weight.
  - 3. Operating and maintenance data.
  - 4. Coordination letter from controls vendor indicating all control points have been coordinated between equipment supplier and controls vendor.

**PART 2 - PRODUCTS**

2.1 ENERGY RECOVERY UNITS

- A. Acceptable Manufacturers: Aldes, Panasonic, or equal
- B. Description: Fully variable ECM fan speed modulation, counterflow plate-type heat and humidity transfer.
- C. Cabinet: Polypropylene corrosion proof, double wall construction, nano-particle metal-oxide insulation.
- D. Fan Motor:

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1. ECM variable airflow adjustability and balancing with mechanical turn potentiometers, remote variable airflow adjustability via 0-10V signal.
- E. Filters: MERV 11, qty two

**PART 3 - EXECUTION**

**3.1 ENERGY RECOVERY UNIT**

- A. Installation:
1. Install unit where shown, with air filters in place before operating unit. Comply with manufacturer's recommendation.
- B. Flexible Connections:
1. Provide flexible connections between fans and the connected ducts or plenums.
  2. Install with 1-inch space between the fan and connecting duct with fabric snug but not stretched tightly.
  3. Provide accurate alignment between fan and duct.
  4. Secure in place with flanged connections. Do not crimp into the duct construction. Ends of the screws shall not project into the duct more than 1/8 inch.
- C. Start-Up:
1. General: Comply with manufacturer's instructions.
  2. Start-up of units shall be provided under the direct supervision of the manufacturer's representative with factory trained personnel.
- D. Testing and Adjusting/Performance Test: Except where initial unit operation clearly shows the performance meets or exceeds the requirements, test to show compliance. Tests performed by the manufacturer's representative in the presence of the Engineer.

**END OF SECTION**

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**SECTION 23 81 43**

**AIR-SOURCE HEAT PUMPS**

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

1. Drawings and general provisions of the contract, including general and supplemental conditions, and Division 01 sections apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
3. Section 01 1813 Sustainable Design Requirements.

**1.2 SUMMARY**

- A. Section includes packaged, air-cooled, electric-motor driven, scroll heat pumps.
- B. Related Sections:
  1. Division 01 Section "General Requirements."
  2. Section 23 0500 Common Work Results for HVAC
  3. Section 23 0548 Vibration and Seismic Controls for HVAC Piping and Equipment
  4. Section 23 0593 Testing, Adjusting, and Balancing
  5. Section 23 2113 Pipe and Pipe Fittings HVAC

**1.3 ACTION SUBMITTALS**

- A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.
  1. Performance at ARI standard conditions and at conditions indicated.
  2. Performance at ARI standard unloading conditions.
  3. Performance at varying capacity with constant design entering condenser-air temperature. Repeat performance at varying capacity for different entering condenser-air temperatures from design to minimum in 10 deg F increments.
- D. Operation and Maintenance Data: Submit O&M manual immediately after the heat pump's production order has been placed. The O&M manual shall include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams. The O&M manual shall only be provided for the specific model, serial number and location of the specific unit installed for the project. The actual heat pump sheet including the actual tested voltage, amperages, and measured flow shall be updated and included in the O&M manual. Generic fan data sheet, O&M manual is not acceptable.
- B. Shop Drawings:
  1. Include mounting and attachment details.

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2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Size and location of piping and wiring connections.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Seismic Qualification Certificates: For air-source unitary heat pumps, accessories, and components, from manufacturer.
  1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned outlined drawings of equipment identifying the center of gravity and location and description of mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Startup service reports.
- C. Sample Warranty: For manufacturer's warranty.

**1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For air-source unitary heat pumps to include in emergency, operation, and maintenance manuals.

**1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

**1.7 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of air-source unitary heat pumps that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, refrigeration components.
  2. Compressor Warranty Period: 5 years from date of Substantial Completion.

**1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver to site, store, and protect products under provisions of Division 23 Section "Common Results for HVAC", Part 1.16 Material Delivery and Storage.
- B. Protect motors, shafts, and bearings from weather and construction dust.



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**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Comply with all performance parameters stated on the drawing schedule. Heat pump unit must meet or exceed efficiency and acoustic parameters to be considered as a potential substitution.

**2.2 AIR-SOURCE HEAT PUMPS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Aermec
2. Substitutions: See Section 01 60 00 – Product Requirements.

- B. General: Factory-assembled and performance-tested reversible air/water heat pump complete with base and frame, scroll compressors, brazed plate evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories; All the components shall be assembled by the same manufacturer. The unit must have the following capabilities:

1. Each unit shall be characterized by low noise.
2. Each unit shall be able to produce water up to 140F/131F, working with a variable external air temperature between -4F and 107F. When operating as a chiller; it shall be able to produce water down to 39.2F, with external air between 14F and 114F.
3. The unit shall start intelligent defrost based on temperature and suction pressure of external coil. When the suction pressure drops below product specified pressure compare to clean coil value, it should start defrost cycles.
4. Each unit shall use A1 classified refrigerant R410A according to ASHRAE34-1997 standard.
5. Each unit shall have hermetic scroll type compressor installed on anti-vibrations mounts. The compressor should be isolated using sound absorbent material.
6. Each unit shall include cooling cycle reversing valve to reverse refrigerant flow in variation of summer/winter mode and defrost cycles.
7. Each unit shall ensure and maintain high COP, even in low temperature conditions, in heating mode.
8. Each unit shall include thermoplastic helical fans to allow low noise. The ventilation unit should be activated asynchronous electric motors with internal magnet circuit breaker protection and metal protection grids for the fans according to IEC EN 60335-2-40 Standards and protection rating is IP51.
9. Each unit shall include power section, control circuit board, view on the unit and safety display following standards: IEC EN60335-2-40, IEC EN 61000-6-1/2/3/4 and with directives regarding electromagnetic compatibility EMC2004/108/E.
10. Each heat pump unit shall be equipped with following safety and control devices:
  - a. High pressure switch
  - b. High and low pressure transducer
  - c. Magnetic circuit breaker to protect compressor, fans and auxiliary
  - d. Water temperature probe at the inlet and outlet of the compressor
  - e. External air temperature probe
  - f. Defrosting probe to detect the temperature of the air-refrigerant exchanger
  - g. Temperature probe on the pressing line side

- C. Cabinet:

1. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
2. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.

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3. Casing: Galvanized steel.
  4. Finish: Coat base, frame, and casing with rustproof polyester paint.
- D. Compressor:
1. Description: Positive-displacement direct drive with hermetically sealed casing.
  2. Each compressor has crankcase oil heater, and suction strainer.
  3. Capacity Control: On-off compressor cycling.
  4. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug, and initial oil charge.
  5. Vibration Isolation: Mount individual compressors on vibration isolators.
  6. Compressors must be enclosed in acoustically insulated and weatherproof compartment.
- E. Refrigeration:
1. Refrigerant: R-410A. Classified as Safety Group A1 according to ASHRAE 34-1997.
  2. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
  3. Refrigerant Circuit: Shall include a thermal-expansion valve, a discharge check valve, a mechanical dehydrator filter, a sight glass with moisture indicator, a liquid-line solenoid valve, an insulated suction line, and high and low pressure safeties. High pressure safeties shall require a manual reset.
  4. The unit shall have single refrigerant circuit with single compressor.
- F. Evaporator:
1. Brazed Plate:
    - a. Type 316 stainless-steel construction.
    - b. Externally insulated with closed cell material to reduce thermal dispersions.
  2. Heater: Factory-installed and wired electric heater with integral controls designed to protect the evaporator.
  3. Evaporator shall be provided with an inlet strainer and flow switch.
  4. The evaporator shall have one refrigerant circuit on the refrigerant side, and one circuit on the water side.
- G. Air-cooled Condenser:
1. Condenser coils shall be constructed from seamless copper tubes mechanically expanded into aluminum fins and shall have integral subcooling circuits.
  2. Condenser fans shall be axial type, aerodynamically designed for ultra-low noise level generation.
- H. Hydronic kit integrated to the unit:
1. Pump: integrated to the unit
  2. Expansion tank: 1.32 gallon capacity tank is integrated to the unit.
  3. Storage tank: stainless steel tank insulated with polyurethane material with suitable thickness and with capacity of 26.4 gallons.
- I. Electrical:
1. A centrally located weatherproof control panel shall contain the unit control system, control interlock terminals and field-power connection points. Hinged control panel access doors shall be tool-lockable. Barrier panels shall be provided to protect against accidental contact with line voltage when accessing the control system.
  2. Power and starting components shall include: individual contactors and circuit breakers for fan motors, circuit breakers and factory mounted transformers for each control circuit, unit power terminal blocks for connection to remote disconnect switch. Fan motors shall have inherent overload protection and compressor motors shall have three-phase motor overload protection.
  3. Chiller shall be supplied with factory installed non-fused disconnect.

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4. Wiring shall be numbered and color-coded to match wiring diagram.
5. Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.

J. Controls:

1. Unit shall be equipped with a standalone microprocessor based control system. The control logic shall be designed to maximize operating efficiency and equipment life with protections for operation under unusual conditions. The system shall intelligently stage the unit to sustain leaving water temperature precision and stability while minimizing compressor cycling.
2. The controller shall support the following safety and operating controls: high pressure switches for each refrigerant circuit; loss of flow in the evaporator water circuit; condenser fan staging by head pressure; digital setting of low evaporator water temperature cutout, high pressure cutout, suction pressure cutout, and freeze protection cutout; compressor soft loading; demand limit control based on 4-20 mA DC signal input; automatic circuit lead/lag based on fewest operating hours (with manual override); chilled water reset based on an externally applied 4-20 mA signal.
3. The keypad/display shall provide access to all vital equipment data. Data shall include full description of current unit status, set point parameters, and alarms.
4. Control system shall: continuously perform self-diagnostic checks; monitor all system temperatures, pressures and safeties; and shall automatically shut down a compressor, refrigerant circuit or entire unit should a fault occur. Diagnostic function shall provide operator with a pre-alarm status indication allowing time to take corrective action prior to a safety shutdown.
5. Controller shall provide output contact closure for control of chilled water pump.
6. The chiller shall be capable of communications with Building Automation System supporting Modbus communications protocol. The information communicated between the BAS and the factory mounted unit controllers shall include the reading and writing of data to allow unit monitoring, control and alarm notification as specified in the unit sequence of operation and the unit points list.

K. Defrost:

1. The units must include intelligent defrost. This allows the unit to go in defrost only when is needed, avoiding unnecessary defrost cycles. This shall be achieved by monitoring the suction pressure decay and the OAT.
2. The unit must have the ability to defrost one circuit at the time.
3. Timed defrost is not allowed.
4. Heat pumps performance and efficiency should take into consideration of defrost cycles.
5. Defrost cycle should not usually be less than 2 minutes and not more than 6 minutes.
6. During defrost cycle, condenser fan should be off.
7. Defrost will start only when external air temperature is less than 50F .
8. Low pressure threshold on the coil should be less than 5.2 bar/75.42 Psi.
9. When the pressure variations between clean and uncleaned coil is 0.6 bar/8.70 psi, defrost will start automatically.
10. Minimum time between two defrost should be greater than 15 minutes

L. Quality Control:

1. Heat pump shall be manufactured in an ISO 9001 certified facility. Each unit shall be factory performance tested, full load efficiency and full load capacity. Test reports shall be made available upon request.
2. The unit plate should include the EC mark.

M. Delivery, storage, and handling:

1. All outdoor units, indoor units, controls and piping components shall be stored and handled according to the manufacturer's recommendation.
2. All outdoor units, indoor units, refrigerant branch units, controls and piping components shall be stored and handled according to the manufacturer's recommendation.

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- N. Warranty:
1. Each unit's parts are warranted to be free from manufacturing defects for up to 1 year from the date of installation.
  2. Each Unit's compressor is warranted for 1 year from the date of start up. Start up must be done within 90 days of installation. Otherwise the warranty will start from the date of installation.
  3. Valves, storage tank, expansion tank and control are warranted to be free from defects for up to 1 year from the date of installation.

**PART 3 - EXECUTION**

3.1 HOLD AND INSPECTION

- A. Refer to provisions of Division 01 Section "Special Procedures" for hold points for inspection, witnessing testing, etc.

3.2 EXAMINATION

- A. Before installation, examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting performance, maintenance, and operations.
1. Locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- C. Examine roughing-in for piping and electric installations for water-source unitary heat pumps to verify actual locations of piping connections and electrical conduits before installation.
- D. Meet requirements of Division 01, "Demonstration and Training" and "Commissioning".
1. Provide support including false loading equipment for Commissioning function test to verify units' supplemental heat for morning warm up / low temperature operation is functional.
- E. Subcontractor shall provide 48 hours' advanced notice of all inspections to the end user/owner to witness inspection. Hold for inspection or witness.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Equipment Mounting:
1. Install air-source, unitary heat pumps per mechanical detail. Comply with requirements for equipment bases and foundations specified in Section 03.
  2. Comply with requirements for vibration-isolation and seismic-restraint devices specified in Section 23.
  3. Maintain manufacturer's recommended clearances for service and maintenance.
  4. Charge with refrigerant if not factory charged and fill with oil if not factory installed.
  5. Install separate devices furnished by manufacturer and not factory installed.
  6. All outdoor equipment to have coating acceptable for marine environment.
- B. Strainers shall be installed on cooling loop inlets of the chiller bank. Strainers must be field installed external to chiller for ease of service. Strainers located inside of headers, requiring disassembly for cleaning are not permitted.

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**3.4 CONNECTIONS**

- A. Comply with requirements in Section 23 2113 Pipe and Pipe Fittings HVAC. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to heat pump to allow service and maintenance.
- C. Connect each drain connection with a union and drainpipe and extend pipe, full size of connection, to drain.
- D. Water Quality
  - 1. All water loops that come into contact with the brazed plate heat exchangers shall adhere to the below water quality parameters:

Property of Fluid	Recommended Level
Ammonia	Less than 2.0 mg/l
CaCO <sub>3</sub> Alkalinity	30 – 500 mg/l
CaCO <sub>3</sub> Hardness	30 – 500 mg/l
Chlorides	Less than 200 mg/l
Dissolved Solids	Less than 1000 mg/l
Iron	Less than 5.0 mg/l
Manganese	Less than 0.4 mg/l
Nitrate	Less than 100 mg/l
pH	7.0 – 9.0
Sulphate	Less than 200 mg/l

**3.5 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following field tests and inspections:
  - 1. After installing air to water heat pumps and after electrical circuitry has been energized, test units for compliance with requirements.
  - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Heat pumps will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

**3.6 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Inspect for visible damage to unit casing.
  - 3. Inspect for visible damage to compressor and coils.
  - 4. Inspect internal insulation.
  - 5. Verify that labels are clearly visible.

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6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Adjust vibration isolators.
9. Start unit according to manufacturer's written instructions.
10. Complete startup sheets and attach copy with Contractor's startup report.
11. Inspect and record performance of interlocks and protective devices; verify sequences.
12. Operate unit for an initial period as recommended or required by manufacturer.
13. Verify thermostat calibration.
14. Inspect controls for correct sequencing of heating, refrigeration, and normal and emergency shutdown.

**3.7 ADJUSTING**

- A. Adjust initial temperature set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four visits to Project during other-than-normal occupancy hours for this purpose.
  1. Factory representative must participate in the Commissioning process. A minimum of two of these visits shall be dedicated to supporting functional testing of the equipment in the Commissioning process.

**3.8 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-source unitary heat pumps.

END OF SECTION

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**SECTION 26 05 00.31**

**GENERAL REQUIREMENTS FOR THE PV ELECTRICAL SYSTEM**

**PART 1 GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. The work of this Section consists of providing all required labor, supervision, materials and equipment (except equipment furnished by the Owner to be installed by the Contractor) to satisfactorily complete the work shown on the drawings and/or specified in all Sections of Division 26 related to PV systems and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete and fully operating facility. The work shall include but not be limited to the following:
  - 1. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

**1.2 RELATED WORK:**

- A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 1 and apply to all Sections of Division 26.

**1.3 STANDARDS AND CODES:**

- A. All work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
  - 1. California Electrical Code (CEC)
  - 2. American National Standards Institute (ANSI) Publications:
    - a. C2-02 National Electrical Safety Code
  - 3. Code of Federal Regulations (CFR):
    - a. 29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)
  - 4. Electronics Industries Association (EIA)
  - 5. Institute of Electrical and Electronics Engineers (IEEE)
  - 6. National Electrical Testing Association (NETA):
    - a. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, Standard ATS
  - 7. National Electrical Manufacturers Association (NEMA)
  - 8. Occupational Safety and Health Act (OSHA) Standards
  - 9. State of California Public Utilities Commission:
    - a. General Order 128 Rules for Construction of Underground Electric Supply and Communication Systems
- B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.

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- C. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Safety labeling and listing by other organizations, such as ETL Testing Laboratories, may be substituted for UL labeling and listing if acceptable to the Owner. Provide service entrance labels for all equipment required by the NEC to have such labels.

**1.4 SUBMITTALS:**

- A. As specified in Division 1. Submit to the Engineer shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Obtain approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review.
- B. Submittals are required for all items, regardless of whether they are furnished as specified or are substituted.
- C. Information to be submitted includes manufacturer's name, trade name, equipment model number, nameplate data, equipment drawings including: size, layout dimensions and capacity, manufacturer's descriptive literature of cataloged products, diagrams, fault and coordination study, seismic calculations, test data, and performance and characteristic curves as applicable. Furnish project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.
- D. If submittal information includes multiple products, items being submitted for approval shall be clearly identified and items not to be used on the project shall be clearly marked out.
- E. Organize submittals for equipment and items related to each specification section together as a package.
- F. Submit submittal packages in three ring binders. Fold drawings and insert into pockets in three ring binders.
  - 1. Certificates of Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements that imply the item does not meet requirements specified, such as "as good as", "achieve the same end use and results as materials formulated in accordance with the referenced publications;" or "equal or exceed the service and performance of the specified material." Certifications shall state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official, authorized to sign certificates of conformance.

**G. SUBSTITUTIONS:**

- 1. The equipment included in the Contract Documents is used to establish standards of quality, utility, and appearance. Equipment which in the opinion of the Engineer

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is equal in quality, utility, and appearance will be approved as substitutions to that specified.

- a. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the Engineer prior to bidding.
2. Substitutions will be accepted for review where there is a reasonable reason for the substitution. Reasonable reasons include:
  - a. Cost savings to the owner. Include deductive change order with submittal.
  - b. A product with features providing additional benefits to the end user.
  - c. Improved finished environment / Lay out of the final installation.
  - d. Delivery considerations.
  - e. Owner's specific requests.
3. Where items are noted as "or equal", a product of equal design, construction and performance will be considered.
4. Any item proposed as a substitute shall be accompanied by drawings and/or data giving sizes, capacities, all pertinent test data, catalog cut sheets, product information, and all other necessary information required to substantiate that the product is equal or exceeds that specified.
5. Substitutions shall be equal, in the opinion of the Engineer, to the specified equipment. The burden of proof of such shall rest with the Contractor. When the Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted equipment to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Plans or Specifications.
6. Only one substitution will be considered for each product specified.
7. Alternate manufacturers must be submitted for approval 10 days prior to bid date unless noted otherwise in Division 1.
8. The Contractor shall be responsible for all expenses in connection with the substitution materials, process, and equipment, including the effect of his/her substitution on him/her, his/her subcontractor's or other Contractor's work. No substitution shall be permitted without written authorization of the Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

**H. CLOSEOUT SUBMITTALS:**

1. Cost analysis: Submit final cost information including original bid and any change orders broken down by system, material and labor costs (as applicable):
  - a. Power distribution
  - b. Lighting and lighting controls
  - c. Photovoltaic system

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- d. Emergency generator system
- 2. Operation and Maintenance Manuals: Furnish O & M Manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 1. Electrical O & M Manuals shall include as a minimum:
  - a. Copies of equipment supplied on the project.
  - b. Instruction manuals including operation instructions and maintenance requirements/recommendations.
  - c. List of suppliers for all equipment with addresses and telephone numbers.
  - d. List of service support for all equipment with addresses and telephone numbers.
  - e. Copies of all test reports required in Division 26 specification sections.
  - f. Spare Parts: For each piece of equipment, submit a list of recommended spare parts. Include part numbers and the name, address, and telephone number of the supplier.
  - g. Other closeout documentation and test results as required under other sections of the specifications.
  - h. Provide in a single transmittal.
  - i. Warranty for all work, including contractor's general warranty.
  - j. All warranties begin as per the Contract, Division 1 or final acceptance of the Work by the Owner, Architect, Engineer, and Authority Having Jurisdiction, which ever is later.
    - 1) Lamps and ballasts are to be covered as per specification 26 50 00.
    - 2) Manufacturer's Warrantees and Guarantees that are longer than the base contract/specified amount are to be provided with the manuals.
    - 3) The Contractor is responsible for all Warranty and Guarantee work whether or not the Manufacturer also Warrantees and Guarantees the product.

**1.5 CONTRACT DOCUMENTS:**

- A. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for the installations.
  - 1. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Engineer for favorable review.
  - 2. All drawings and divisions of these specifications shall be considered as whole. This contractor shall report any apparent discrepancies prior to submitting bids.
  - 3. Should there be a conflict or discrepancy between the drawings and specifications, or between different drawings sheets, or between different specification sections, the most expensive option shall be required, at the discretion of the Engineer.
- B. Drawings:
  - 1. The Drawings shall govern the general layout of the completed construction:

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- a. Locations of equipment, inserts, anchors, panels, pullboxes, manholes, conduits, stub-ups, fittings, power and convenience outlets, lighting fixtures and ground connections are approximate unless dimensioned; verify locations with the Engineer prior to installation. Field verify scaled dimensions on Drawings.
- b. The general arrangement and location of existing conduits, piping, apparatus, etc., is shown as existing on drawings or specified. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Extreme accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Engineer.

**1.6 COORDINATION:**

- A. Coordinate the electrical work with the other trades, code authorities, utilities and the Engineer:
  - 1. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
  - 2. Coordinate does not mean to only send a Request For Information. Coordinate implies that the contractor is to take the lead in bringing all of the necessary organizations together to coordinate the work and to provide for the associated costs.
- B. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities:
  - 1. Include costs for work during non-normal working hours and temporary facilities as may be required.
  - 2. Include costs as necessary for sub-contractors as necessary to accomplish the specified work.
- C. When two trades join together in an area, make certain that no electrical work is omitted. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
- D. OPERATIONS:
  - 1. Perform all work in compliance with Division 1:
    - a. Keep the number and duration of power shutdown periods to a minimum.
    - b. Show all proposed shutdowns and their expected duration on the construction schedule.
      - 1) If the construction schedule is created and maintained by others, make sure that the associated information is incorporated.

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- 2) Failure by the Contractor to properly schedule and plan for such activities is not a basis for additional compensation.
  - c. Carry out shutdown only after the Engineer has favorably reviewed the schedule. Submit power/communications interruption schedule 15 days prior to date of interruption. Failure to provide schedule with adequate review time may result in rescheduling of the work at the Contractor's expense.
- E. CONSTRUCTION POWER:
- 1. See Division 1 Temporary Utilities.
- F. STORAGE:
- 1. Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from sun, weather, condensation, dust, water, or construction operations.
- G. DAMAGED PRODUCTS:
- 1. Notify the Engineer in writing in the event that any equipment or material is damaged. Obtain approval from the Engineer before making repairs to damaged products.
- H. Order material in such a timely manner and after approval of the same so as to insure that the approved material is available to be installed on site in a timely manner. Additional costs or substitutions necessitated because the Contractor failed to order material in a timely manner are not reimbursable. Costs associated with processing of paperwork by the owner and design consultants resultant of such failures to coordinate the work by the Contractor shall have such costs reimbursed by the Contractor.

**1.7 LOCATIONS:**

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.
- 1. Dry Locations:
    - a. All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
  - 2. Wet Locations:
    - a. All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

**1.8 SAFETY AND INDEMNITY:**

- A. Lock out Requirements:
- 1. Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147
- B. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and properly during performance of the work. This requirement will apply continually and not be limited to normal working hours.

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- 2. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
- 3. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the engineer, their Consultants or their officers, agents and employees.

**PART 2 PRODUCTS**

**2.1 STANDARD OF QUALITY:**

- C. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.
- D. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.
- E. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

**2.2 NAMEPLATES:**

- F. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.
- G. Additionally, identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 1 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel screws or, where favorably reviewed by the Engineer, with epoxy

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cement. Where no inscriptions are indicated on the Drawings, furnish nameplates with appropriate inscriptions furnished by the Engineer upon prior request by the Contractor.

- H. Each control device, including push buttons, control switches, and indicating lights, shall have an integral legend plate or nameplate indicating the device function. These shall be inscribed as indicated on the Drawings or as favorably reviewed by the Engineer.

**2.3 FASTENERS:**

- I. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

**2.4 Warning Signs:**

- J. Provide enamel warning signs for the enclosures of electrical substations, transformers, and switchgear having nominal rating exceeding 600 volts. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 14 inches by 10 inches with the legend "DANGER HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 3 inch high white letters on a red and black field. Spray painted stencils are not acceptable.

**2.5 Finish requirements:**

- K. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.
- L. In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

**PART 3 EXECUTION**

**3.1 INSTALLATION:**

- A. Ensure that all equipment and materials fit properly in their installation.
- B. Perform any required work to correct improperly fit installation at no additional expense to the owner.
- C. Equipment Installation:
  - 1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
  - 2. In all rooms with concrete floors, install all floor mounted equipment on reinforced concrete pads as shown. Insure that pads are seismically secured to the building structure. The Contractor, suppliers, and fabricators shall take this requirement into consideration when designing, fabricating, and installing panels and other enclosures so that height above the floor of the operating handles of electrical devices meets the requirements of these Specifications and applicable codes.
  - 3. Mount all metal panels which are mounted on or abutting concrete walls or any outside walls ¼ inch from the wall, and paint the back sides of the panels with Mobil Hi-Build Bituminous Coating 35-J-10, Kopper Bitumastic Super Tank Solution, or equal. Film thickness shall be 10 mils minimum.

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D. Cutting, Drilling and Welding:

1. Provide the required cutting, drilling welding that is required for the electrical construction work. Comply with Division 1 requirements.
2. Structural members shall not be cut or drilled, except after approval by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.
3. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel. Where welding is required, it shall be accomplished by tradesmen certified to do such work. Provide fire and other protection as appropriate.

**3.2 FIELD TESTS:**

- A. Test shall be in accordance with Acceptance Testing specifications issued by the National Electrical Testing Association (NETA).
- B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Perform each operational check three times to ensure the circuit and components are working properly. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Engineer prior to any test so that the tests may be witnessed.
- C. Provide instruments, other equipment, temporary facilities as may be necessary, and material required for the tests. These shall be of the type designed for the type of tests to be performed and shall be calibrated by a recognized testing laboratory within three months prior to testing.
- D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.
- E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Engineer. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- F. Perform calibration and adjustment on all equipment. Where the values for adjustment are not shown on the Drawings, obtain the proper values from the Engineer.
- G. Maintain records of each test and submit five copies to the Engineer when testing is complete. All tests shall be witnessed by the Engineer. These records shall include:
  1. Name of equipment tested.
  2. Date of report.
  3. Date of test.
  4. Description of test setup.
  5. Identification and rating of test equipment.

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- 6. Test results and data.
  - 7. Name of person performing test.
  - 8. Owner or Engineer's initials.
- H. Items requiring testing as a minimum:
- 1. Ground field grid.
  - 2. Circuit Breakers.

**3.3 FAULT AND COORDINATION STUDY:**

- A. Obtain a letter from the serving utility company that indicates the available fault current.
- B. At the Contractor's expense, obtain from a registered professional engineer licensed in the State of California a Fault and Coordination Study:
  - 1. That provides settings for all adjustable overcurrent devices.
  - 2. That reflects the actual size and length of all feeders as installed.
  - 3. That reflects all overcurrent devices individually mounted.
  - 4. That reflects all overcurrent devices group mounted.
  - 5. That reflects all motors in excess of 10 horsepower.
  - 6. That reflects each elevator
  - 7. That reflects each generator, automatic transfer switch, photovoltaic cell and / or other source of power.
  - 8. That confirms that equipment furnished under other sections of the specifications will sustain the associated available fault currents.
  - 9. That identifies any potential problems
  - 10. Transmit five copies for review and comment prior to or with the distribution equipment submittals.
- C. Furnish, at no additional expense to the Owner, overcurrent protective devices that meet or exceed the fault values determined by the study, regardless of other requirements listed on the drawings or in other areas of the specification. Series rated devices may be used at the Contractor's discretion.
- D. Coordinate all devices, wherever possible, to meet the recommendations of the ANSI/IEEE Standard 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

**3.4 PAINTING OF EQUIPMENT:**

- A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.
- B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

**3.5 SIGNAGE:**

- A. Nameplate Mounting:

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1. Provide number, location and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two stainless steel sheet-metal screws or two rivets.

**B. Warning Sign Mounting:**

1. Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.
2. All enclosures of all types containing equipment or components functioning in excess of 600 volts AC shall have labels reading “Danger – Voltage In Excess OF 600 Volts” on enameled signs with 3” minimum lettering on all accessible sides of said equipment or components.
3. All enclosures or assemblies containing equipment or components functioning with a nominal available current in excess of 1000 VA DC shall have labels reading “Danger – High DC Currents” on enameled signs with 3” minimum lettering on all accessible sides of said equipment or components.

**3.6 RECORDS:**

- A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the record “as built” condition. After completion of the work, the Contractor shall neatly and carefully mark the work as actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:
1. Cable Size and Type: Provide the size and type of each cable installed on the project.
  2. Substructure: Where the location of duct lines, adjacent utilities, cable boxes, and manholes are found to different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.
  3. Record (As Built) Drawings: At the completion of the Work the Contractor shall provide a set of record “as built” drawings over to the Owner for his use.
    - a. Record drawings are required to be transmitted within 30 days of beneficial occupancy.
    - b. Transmittal and approval process:
      - i. Contractor is to transmit one printed copy for review and comment.
      - ii. After acceptance of the above, the Contractor is to transmit three printed sets and one reproducible set.
      - iii. Contractor to provide information on their company in the margin of record drawings along with the date of the revisions and the associated revision number.

**3.1 POSTED OPERATING INSTRUCTIONS:**

- B. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

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1. Single line diagrams, wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment at each major piece of distribution equipment.
2. Start up, proper adjustments, operating, lubrication and shutdown procedures.
3. Safety precautions.
4. The procedure in the event of equipment failure.
5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

**3.7 INSTRUCTION TO OWNER'S PERSONNEL:**

- A. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or systems has been accepted and turned over to the Owner for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.
- B. Contractor shall maintain an attendance sheet from each session which contains the following information:
  1. Attendees with associated arrival and departure time.
  2. Topics covered.
  3. Information provided.
  4. Signatures of attendees taken at the completion of the session.

**3.8 CLEAN UP:**

- A. Thoroughly clean all soiled surfaces of installed equipment and materials.
- B. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Engineer.

**END OF SECTION**

	260500.31 - 12	General Requirements for PV Electrical Systems
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**SECTION 260519  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.

**1.2 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable 2018.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

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- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- N. UL 267 - Outline of Investigation for Wire-Pulling Compounds Most Recent Edition, Including All Revisions.
- O. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- P. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- Q. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- S. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

**1.8 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

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**PART 2 PRODUCTS**

**2.1 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.

**2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
- I. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
  - 3. Color Code:
    - a. Equipment Ground, All Systems: Green.

**2.3 SINGLE CONDUCTOR BUILDING WIRE**

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.

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- b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 4 AWG and Larger: Type XHHW-2.
    - b. Installed Underground: Type XHHW-2.

**2.4 METAL-CLAD CABLE**

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.
- G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

**2.5 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Wiring Connectors for Splices and Taps:
- C. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. Mechanical Connectors: Provide bolted type or set-screw type.
- G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

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**2.6 ACCESSORIES**

- A. Electrical Tape:
  - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  - 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
  - 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  - 5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. Wire Pulling Lubricant:
  - 1. Listed and labeled as complying with UL 267.
  - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  - 3. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

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**3.3 INSTALLATION**

- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. When circuit destination is indicated without specific routing, determine exact routing required.
  - 3. Arrange circuiting to minimize splices.
  - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
  - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
    - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
    - b. Size raceways, boxes, etc. to accommodate conductors.
  - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- H. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.



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- b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
  - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  - 3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

**3.4 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

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- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

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**SECTION 260526  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

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**PART 1 GENERAL**

**2.1 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground access wells.

**2.2 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 011813 - Sustainable Design Requirements
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**2.3 REFERENCE STANDARDS**

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2022.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

**2.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

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**2.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.

**2.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**2.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**3.1 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- E. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  - 3. Metal In-Ground Support Structure:

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- a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
  - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
  - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
  - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
  - c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
  - d. Provide ground access well for each electrode.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
  - a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
- F. Bonding and Equipment Grounding:
  1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
  8. Provide bonding for metal building frame.
- G. Communications Systems Grounding and Bonding:

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1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
  - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
  - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
  - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

**3.2 GROUNDING AND BONDING COMPONENTS**

- A. General Requirements:
  1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
  1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.
- E. Ground Rod Electrodes:
  1. Comply with NEMA GR 1.
  2. Material: Copper-bonded (copper-clad) steel.
  3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
- F. Ground Access Wells:
  1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
  2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.

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3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches (250 mm).
4. Cover: Factory-identified by permanent means with word "GROUND".

**PART 3 EXECUTION**

**4.1 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**4.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
  1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
  2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.
- D. Make grounding and bonding connections using specified connectors.
  1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 260553.

**4.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**END OF SECTION**

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**SECTION 260529  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.2 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- E. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.
- F. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
  - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.



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5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. NFPA 70.
    - b. Requirements of authorities having jurisdiction.
  2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
  3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
  4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 125%. Include consideration for vibration, equipment operation, and shock loads where applicable.
  5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  2. Comply with MFMA-4.

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- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
  - 1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
  - 2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  - 3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  - 4. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
- G. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
  - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  - 3. Hollow Stud Walls: Use toggle bolts.
  - 4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  - 5. Sheet Metal: Use sheet metal screws.
  - 6. Wood: Use wood screws.
  - 7. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    - b. Comply with MFMA-4.
    - c. Channel Material: Use galvanized steel.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

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2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches (80 mm) in height; see Section 033000.
  5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners in accordance with manufacturer's recommended torque settings.
- J. Remove temporary supports.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

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**SECTION 260533.13  
CONDUIT FOR ELECTRICAL SYSTEMS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Galvanized steel electrical metallic tubing (EMT).
- F. Stainless steel electrical metallic tubing (EMT).
- G. High-density polyethylene (HDPE) conduit.

**1.2 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 078400 - Firestopping.
- C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- D. Section 260526 - Grounding and Bonding for Electrical Systems.
- E. Section 260529 - Hangers and Supports for Electrical Systems.
- F. Section 260533.16 - Boxes for Electrical Systems.
- G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 011813 - Sustainable Design Requirements
- I. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

**1.3 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.
- D. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing 2020.
- E. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing 2016.
- F. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing 2016a (Reapproved 2022).
- G. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD) 2016.

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- H. ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct 2017.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- J. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- K. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- L. NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit 2021.
- M. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- O. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- P. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- Q. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- R. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit Current Edition, Including All Revisions.
- S. UL 746C - Polymeric Materials – Use in Electrical Equipment Evaluations Current Edition, Including All Revisions.
- T. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- U. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel Current Edition, Including All Revisions.
- V. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.
- W. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:

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1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
  2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

**1.6 QUALITY ASSURANCE**

- A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.
- B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or high-density polyethylene (HDPE) conduit.
  2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or high-density polyethylene (HDPE) conduit.
  3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or high-density polyethylene (HDPE) conduit.
  4. Where high-density polyethylene (HDPE) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) where emerging from underground.
  5. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
- D. Embedded Within Concrete:

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1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC). Embed within structural slabs only where approved by Structural Engineer.
- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel electrical metallic tubing (EMT).
- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel intermediate metal conduit (IMC) or galvanized steel electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).
- J. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).
- K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).
- M. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
- N. Flexible Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit (FMC).
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
- O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC) or galvanized steel electrical metallic tubing (EMT).

**2.2 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70.
- B. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 3/4-inch (21 mm) trade size.
  2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
  3. Underground, Interior: 3/4-inch (21 mm) trade size.
  4. Underground, Exterior: 1-inch (27 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

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**2.4 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

**2.5 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

**2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

**2.7 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.

**2.8 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Connectors and Couplings: Use compression/gland or set-screw type.



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**2.9 HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT**

- A. Description: NFPA 70, Type HDPE high-density polyethylene solid-wall conduit complying with ASTM F2160 and NEMA TC 7; list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.
- B. Joining Methods: Approved by HDPE conduit manufacturer.
- C. Mechanical Fittings: Comply with ASTM F2176; list and label as complying with UL 651A.
- D. Butt Heat Fusion Fittings: Comply with ASTM D3261.
- E. Socket Fusion Fittings: Comply with ASTM D2683.
- F. Electrofusion Fittings: Comply with ASTM F1055.

**2.10 ACCESSORIES**

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Adhesive for HDPE and RTRC Conduit:
  - 1. Specifically designed for bonding dissimilar materials in lieu of transition fittings, including but not limited to polyethylene, fiberglass, PVC, aluminum, and steel; UL 746C recognized.
  - 2. Approved by adhesive manufacturer for use with materials to be joined.
- D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- E. Foam Conduit Sealant:
  - 1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
  - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  - 3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated without specific routing, determine exact routing required.

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3. Conceal conduits unless specifically indicated to be exposed.
  4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  5. Unless otherwise approved, do not route exposed conduits:
    - a. Across floors.
    - b. Across roofs.
    - c. Across top of parapet walls.
    - d. Across building exterior surfaces.
  6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  7. Arrange conduit to maintain adequate headroom, clearances, and access.
  8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
  9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
  10. Route conduits above water and drain piping where possible.
  11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
  13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.
    - c. Flues.
  14. Group parallel conduits in same area on common rack.
- F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  4. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  5. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
  6. Use of wire for support of conduits is not permitted.
- G. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

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3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
  7. Secure joints and connections to provide mechanical strength and electrical continuity.
- H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
  7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- I. Underground Installation:
1. Provide trenching and backfilling; see Section 312316.13.
  2. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 260553.
- J. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch (27 mm) trade size unless otherwise approved.
  2. Install conduits within middle one third of slab thickness.
  3. Secure conduits to prevent floating or movement during pouring of concrete.
- K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated; see Section 033000.
- L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    - a. Where conduits enter building from outside.

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- b. Where service conduits enter building from underground distribution system.
  - c. Where conduits enter building from underground.
  - d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
- a. Where conduits pass from outdoors into conditioned interior spaces.
  - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- N. Provide grounding and bonding; see Section 260526.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

**3.4 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

**3.5 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

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**SECTION 260533.16  
BOXES FOR ELECTRICAL SYSTEMS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.
- E. Underground boxes/enclosures.
- F. Accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 011813 - Sustainable Design Requirements
- G. Section 262726 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Additional requirements for locating boxes for wiring devices.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

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- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

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2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  12. Wall Plates: Comply with Section 262726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
  2. Use cast iron floor boxes within slab on grade.
  3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
  4. Manufacturer: Same as manufacturer of floor box service fittings.

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- F. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
  4. Applications:
    - a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

**2.2 ACCESSORIES**

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.  
B. Verify that mounting surfaces are ready to receive boxes.  
C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.  
B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.  
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.  
D. Provide separate boxes for emergency power and normal power systems.  
E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.  
F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.  
G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.  
H. Box Locations:
  1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
  2. Unless dimensioned, box locations indicated are approximate.
  3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
  4. Locate boxes so that wall plates do not span different building finishes.
  5. Locate boxes so that wall plates do not cross masonry joints.
  6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.



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7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
  - a. Concealed above accessible suspended ceilings.
  - b. Within joists in areas with no ceiling.
  - c. Electrical rooms.
- I. Box Supports:
  1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
  1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N. Underground Boxes/Enclosures:
  1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
  2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- Q. Close unused box openings.

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- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S. Provide grounding and bonding in accordance with Section 260526.

**3.3 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.4 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
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**SECTION 260553  
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Underground warning tape.
- D. Floor marking tape.
- E. Warning signs and labels.

**1.2 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.7 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

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**PART 2 PRODUCTS**

**2.1 IDENTIFICATION REQUIREMENTS**

- A. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Switchboards:
      - 1) Identify power source and circuit number. Include location when not within sight of equipment.
      - 2) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - b. Panelboards:
      - 1) Identify power source and circuit number. Include location when not within sight of equipment.
      - 2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
  - 2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.
  - 3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    - a. Service equipment.
    - b. Industrial control panels.
    - c. Motor control centers.
    - d. Elevator control panels.
    - e. Industrial machinery.
  - 4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards.
- B. Identification for Conductors and Cables:
  - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
  - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- C. Identification for Boxes:
  - 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- D. Identification for Devices:
  - 1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
- E. Identification for Luminaires:

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**2.2 IDENTIFICATION NAMEPLATES AND LABELS**

- A. Identification Nameplates:
  - 1. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
  - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
  - 3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
  - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

**2.3 UNDERGROUND WARNING TAPE**

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:

**2.4 FLOOR MARKING TAPE**

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches (76 mm) wide, with alternating black and white stripes.

**2.5 WARNING SIGNS AND LABELS**

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
  - 1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
  - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

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**PART 3 EXECUTION**

**3.1 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Interior Components: Legible from the point of access.
  - 7. Boxes: Outside face of cover.
  - 8. Conductors and Cables: Legible from the point of access.
  - 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

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**SECTION 260573  
POWER SYSTEM STUDIES**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Short-circuit study.
- B. Arc flash and shock risk assessment.
  - 1. Includes arc flash hazard warning labels.
- C. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

**1.2 RELATED REQUIREMENTS**

- A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.
- B. Section 262413 - Switchboards.
- C. Section 262416 - Panelboards.

**1.3 REFERENCE STANDARDS**

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).
- B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants 1993 (Reaffirmed 1999).
- C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems 2001, with Errata (2003).
- D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis 1997.
- E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems 2006.
- F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations 2018, with Errata (2019).
- G. NEMA MG 1 - Motors and Generators 2021.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70E - Standard for Electrical Safety in the Workplace 2024.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.

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2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Submit study reports prior to or concurrent with product submittals.
  2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.
  3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Study preparer's qualifications.
- C. Study reports, stamped or sealed and signed by study preparer.
- D. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.
- E. Site-specific arc flash hazard warning labels.
- F. Field quality control reports.
- G. Project Record Documents: Revise studies as required to reflect as-built conditions.
  1. Include hard copies with operation and maintenance data submittals.
  2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

**1.6 POWER SYSTEM STUDIES**

- A. Scope of Studies:
  1. Perform analysis of new electrical distribution system as indicated on drawings.
  2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
  3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
    - a. Known Operating Modes:
      - 1) Utility as source.
      - 2) Battery system as source.
- B. General Study Requirements:
  1. Comply with NFPA 70.
  2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.
- C. Data Collection:
  1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
    - a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      - 1) Obtain up-to-date information from Utility Company.
    - b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.



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- c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
  - d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
  - e. Protective Devices:
    - 1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
    - 2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
  - f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
  - g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
- D. Short-Circuit Study:
- 1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
  - 2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
    - a. Maximum utility fault currents.
    - b. Maximum motor contribution.
    - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
  - 3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.
- E. Arc Flash and Shock Risk Assessment:
- 1. Comply with NFPA 70E.
  - 2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
  - 3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
    - a. Maximum and minimum utility fault currents.
    - b. Maximum and minimum motor contribution.
    - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
- F. Study Reports:
- 1. General Requirements:
    - a. Identify date of study and study preparer.
    - b. Identify study methodology and software product(s) used.
    - c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
    - d. Identify base used for per unit values.
    - e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.

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- f. Include conclusions and recommendations.
- 2. Short-Circuit Study:
  - a. For each scenario, identify at each bus location:
    - 1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
    - 2) Fault point X/R ratio.
    - 3) Associated equipment short circuit current ratings.
  - b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
- 3. Arc Flash and Shock Risk Assessment:
  - a. For the worst case for each scenario, identify at each bus location:
    - 1) Calculated incident energy and associated working distance.
    - 2) Calculated arc flash boundary.
    - 3) Bolted fault current.
    - 4) Arcing fault current.
    - 5) Clearing time.
    - 6) Arc gap distance.
  - b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

## **1.7 QUALITY ASSURANCE**

- A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
  - 1. Study preparer may be employed by manufacturer of electrical distribution equipment.
  - 2. Study preparer may be employed by field testing agency.
- B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.
- C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

## **PART 2 PRODUCTS**

### **2.1 ARC FLASH HAZARD WARNING LABELS**

- A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
  - 1. Materials: Comply with Section 260553.
  - 2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
    - a. Include the following information:
      - 1) Arc flash boundary.
      - 2) Available incident energy and corresponding working distance.
      - 3) Nominal system voltage.

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**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Install arc flash warning labels in accordance with Section 260553.

**3.2 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Adjust equipment and protective devices for compliance with studies and recommended settings.
- D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.
- E. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

**3.3 CLOSEOUT ACTIVITIES**

- A. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.
  - 1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.

**END OF SECTION**

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**SECTION 260923  
LIGHTING CONTROL SYSTEM**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Digital Lighting Controls
  - 2. Relay Panels
  - 3. Emergency Lighting Control (if applicable)
  
- B. Related Sections:
  - 1. Section 26 27 26 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.
  - 2. Section 26 56 19 – LED Exterior Lighting
  - 3. Section 26 51 19 - LED Interior Lighting
  
- C. Control Intent – Control Intent includes, but is not limited to:
  - 1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
  - 2. Initial sensor and switching zones
  - 3. Initial time switch settings
  - 4. Task lighting and receptacle controls
  - 5. Emergency Lighting control (if applicable)

**1.2 QUALITY ASSURANCE**

- A. Manufacturer: Minimum 10 years experience in manufacture of lighting controls.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  
- B. Shop Drawings:
  - 1. Show installation details for the following:
    - a. Occupancy sensors.
    - b. Vacancy sensors.
    - c. Daylighting sensors.
    - d. Inwall controls.
  - 2. Interconnection diagrams showing field-installed wiring.
  - 3. Include diagrams for power, signal, and control wiring.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.

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2. Structural members to which equipment will be attached.
3. Items penetrating finished ceiling, including the following:
  - a. Luminaires.
  - b. Air outlets and inlets.
  - c. Speakers.
  - d. Sprinklers.
  - e. Access panels.
  - f. Control modules.

- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's warranties.

**1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
- B. Software and Firmware Operational Documentation:
  1. Software operating and upgrade manuals.
  2. Program Software Backup: On manufacturer's website. Provide names, versions, and website addresses for locations of installed software.
  3. Device address list.
  4. Printout of software application and graphic screens.

**1.6 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Faulty operation of lighting control software.
    - b. Faulty operation of lighting control devices.

**PART 2 - PRODUCTS**

**2.1 SYSTEM DESCRIPTION AND OPERATION**

- A. The Lighting Control and Automation system as defined under this section covers the following equipment:
  1. Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
  2. Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
  3. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications can provide switching, bi-level, tri-level or dimming control for daylight harvesting.
  4. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt

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or line voltage forward phase control dimming outputs and integral current monitoring capabilities.

- 5. Digital Plug-Load Controllers – Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities.
- 6. Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow bi-directional communication of room variables and occupancy sensor settings. Computer software also customizes room settings.
- 7. Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
- 8. Digital Lighting Management (DLM) segment network – Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded,) to connect multiple DLM local networks for centralized control
- 9. Network Bridge – provides BACnet MS/TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS) and automatically creates BACnet objects representative of connected devices.
- 10. Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
- 11. Programming and Configuration software – Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.
- 12. LMCP Digital Lighting Management Relay Panel – provides up to 8, 24, or 48 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS).
- 13. Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

**2.2 LIGHTING CONTROL APPLICATIONS**

- A. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:
  - 1. Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.

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2. Bi-Level Lighting – Provide multi-level controls in all spaces except toilet rooms, storerooms, library stacks, or applications where variable dimming is used.
3. Task Lighting / Plug Loads – Provide automatic shut off of non essential plug loads and task lighting in all spaces except toilet rooms and storerooms. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
4. Daylit Areas – Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:
  - a. All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones.
  - b. Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes.
  - c. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.
  - d. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.
5. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four (4) pre-set lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to extinguish all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.

**2.3 MANUFACTURERS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Watt Stopper; or a comparable product by one of the following:
1. Cooper Industries, Inc.
  2. Lithonia Lighting; Acuity Brands Lighting, Inc.

**2.4 DIGITAL LIGHTING CONTROLS**

- A. Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

**2.5 DIGITAL WALL SWITCH OCCUPANCY SENSORS**

- A. Wallbox mounted passive infrared PIR or dual technology (passive infrared and ultrasonic) digital occupancy sensor with 1 or 2 switch buttons.
- B. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
1. Digital calibration and pushbutton configuration for the following variables:

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- a. Sensitivity – 0-100% in 10% increments
  - b. Time delay – 1-30 minutes in 1 minute increments
  - c. Test mode – Five second time delay
  - d. Detection technology – PIR, Dual Technology activation and/or re-activation.
  - e. Walk-through mode
  - f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
2. Programmable control functionality including:
    - a. Each sensor may be programmed to control specific loads within a local network.
    - b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
    - c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
    - d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
      - 1) Ultrasonic and Passive Infrared
      - 2) Ultrasonic or Passive Infrared
      - 3) Ultrasonic only
      - 4) Passive Infrared only
  3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
  4. Two RJ-45 ports for connection to DLM local network.
  5. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote personal controls.
  6. Device Status LEDs including:
    - a. PIR detection
    - b. Ultrasonic detection
    - c. Configuration mode
    - d. Load binding
  7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
  8. Assignment of local buttons to specific loads within the room without wiring or special tools
  9. Manual override of controlled loads.
  10. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.
- C. BACnet object information shall be available for the following objects:
1. Detection state
  2. Occupancy sensor time delay
  3. Occupancy sensor sensitivity, PIR and Ultrasonic
  4. Button state
  5. Switch lock control
  6. Switch lock status
- D. Units shall not have any dip switches or potentiometers for field settings.



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- E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.
- F. Two-button wall switch occupancy sensors, when connected to a single relay dimming room controller, shall operate in the following sequence as a factory default:
  - 1. Left button
    - a. Press and release - Turn load on
    - b. Press and hold - Raise dimming load
  - 2. Right button
    - a. Press and release - Turn load off
    - b. Press and hold - Lower dimming load
- G. Low voltage momentary pushbuttons shall include the following features:
  - 1. Load/Scene Status LED on each switch button with the following characteristics:
    - a. Bi-level LED
    - b. Dim locator level indicates power to switch
    - c. Bright status level indicates that load or scene is active
  - 2. The following button attributes may be changed or selected using a wireless configuration tool:
    - a. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
    - b. Individual button function may be configured to Toggle, On only or Off only.
    - c. Individual scenes may be locked to prevent unauthorized change.
    - d. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
    - e. Ramp rate may be adjusted for each dimmer switch.
    - f. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.
- H. WattStopper part numbers: LMPW, LMDW. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

**2.6 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR**

- A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor.
- B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
  - 1. Digital calibration and pushbutton configuration for the following variables:
    - a. Sensitivity – 0-100% in 10% increments
    - b. Time delay – 1-30 minutes in 1 minute increments
    - c. Test mode – Five second time delay
    - d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
    - e. Walk-through mode
    - f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
  - 2. Programmable control functionality including:
    - a. Each sensor may be programmed to control specific loads within a local network.

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- b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
  - c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
  - d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
    - 1) Ultrasonic and Passive Infrared
    - 2) Ultrasonic or Passive Infrared
    - 3) Ultrasonic only
    - 4) Passive Infrared only
  - 3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
  - 4. One or two RJ-45 port(s) for connection to DLM local network.
  - 5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
  - 6. Device Status LEDs, which may be disabled for selected applications, including:
    - a. PIR detection
    - b. Ultrasonic detection
    - c. Configuration mode
    - d. Load binding
  - 7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
  - 8. Manual override of controlled loads.
  - 9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.
- C. BACnet object information shall be available for the following objects:
- 1. Detection state
  - 2. Occupancy sensor time delay
  - 3. Occupancy sensor sensitivity, PIR and Ultrasonic
- D. Units shall not have any dip switches or potentiometers for field settings.
- E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.
- F. WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

**2.7 DIGITAL WALL SWITCHES**

- A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
- 1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
  - 2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

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3. Configuration LED on each switch that blinks to indicate data transmission.
  4. Load/Scene Status LED on each switch button with the following characteristics:
    - a. Bi-level LED
    - b. Dim locator level indicates power to switch
    - c. Bright status level indicates that load or scene is active
  5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
  6. Programmable control functionality including:
    - a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
    - b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
  7. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.
- B. BACnet object information shall be available for the following objects:
1. Button state
  2. Switch lock control
  3. Switch lock status
- C. Two RJ-45 ports for connection to DLM local network.
- D. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.
- E. The following switch attributes may be changed or selected using a wireless configuration tool:
1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
  2. Individual button function may be configured to Toggle, On only or Off only.
  3. Individual scenes may be locked to prevent unauthorized change.
  4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
  5. Ramp rate may be adjusted for each dimmer switch.
  6. Switch buttons may be bound to any load on a room controller and are not load type dependant; each button may be bound to multiple loads.
- F. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

**2.8 DIGITAL DAYLIGHTING SENSORS**

- A. Digital daylighting sensors shall work with room controllers to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to a room controller. Daylighting sensors shall be interchangeable without the need for rewiring.

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1. Closed loop sensors measure the ambient light in the space and control a single lighting zone.
2. Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones.
3. Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone.

**B. Digital daylighting sensors shall include the following features:**

1. The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-6,553 footcandles (fc).
3. The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.
5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.
6. Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
7. Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.
8. Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.
9. Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.
10. Configuration LED status light on device that blinks to indicate data transmission.
11. Status LED indicates test mode, override mode and load binding.
12. Recessed switch on device to turn controlled load(s) ON and OFF.
13. BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
  - a. Light level
  - b. Day and night setpoints
  - c. Off time delay
  - d. On and off setpoints
  - e. Up to three zone setpoints
  - f. Operating mode – on/off, bi-level, tri-level or dimming
14. One RJ-45 port for connection to DLM local network.
15. A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62" thickness (LMLS-400, LMLS-500). Extended tube

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photosensors accommodate mounting materials from 0.62"-1.25" thickness (LMLS-400-L, LMLS-500-L). Mounting brackets are compatible with J boxes (LMLS-MB1) and wall mounting (LMLS-MB2). LMLS-600 photosensor to be mounted on included bracket below skylight well.

16. Any load or group of loads in the room can be assigned to a daylighting zone
  17. Each load within a daylighting zone can be individually enabled or disabled for discrete control (load independence).
  18. All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.
- C. Closed loop digital photosensors shall include the following additional features:
1. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
  2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
  3. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads.
  4. WattStopper Product Number: LMLS-400, LMLS-400-L.
- D. Open loop digital photosensors shall include the following additional features:
1. An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room.
  2. Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.
  3. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.
  4. WattStopper Product Number: LMLS-500, LMLS-500-L.
- E. Dual loop digital photosensors shall include the following additional features:
1. Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from sources outside of this con
  2. Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room.
  3. Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load.
  4. Device must reference closed loop photosensor information as a base line reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is required.

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5. Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes.
6. Device must include extendable mounting arm to properly position sensor within a skylight well.
7. WattStopper product number LMLS-600

**2.9 DIGITAL ROOM CONTROLLERS AND PLUG-LOAD CONTROLLERS**

- A. Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:
1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
  2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.
  3. Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest.
  4. Device Status LEDs to indicate:
    - a. Data transmission
    - b. Device has power
    - c. Status for each load
    - d. Configuration status
  5. Quick installation features including:
    - a. Standard junction box mounting
    - b. Quick low voltage connections using standard RJ-45 patch cable
  6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
    - a. Turn on to 100%
    - b. Remain off
    - c. Turn on to last level
  7. Each load shall be configurable to operate in the following sequences based on occupancy:
    - a. Auto-on/Auto-off (Follow on and off)
    - b. Manual-on/Auto-off (Follow off only)
  8. The polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
  9. BACnet object information shall be available for the following objects:
    - a. Load status
    - b. Electrical current
    - c. Total watts per controller
    - d. Schedule state – normal or after-hours
    - e. Demand response control and cap level
    - f. Room occupancy status
    - g. Total room lighting and plug loads watts

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- h. Total room watts/sq ft
  - i. Force on/off all loads
  - 10. UL 2043 plenum rated
  - 11. Manual override and LED indication for each load
  - 12. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.
  - 13. Zero cross circuitry for each load
  - 14. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
- B. On/Off Room Controllers shall include:
- 1. One or two relay configuration
  - 2. Efficient 150 mA switching power supply
  - 3. Three RJ-45 DLM local network ports with integral strain relief and dust cover
  - 4. WattStopper product numbers: LMRC-101, LMRC-102
- C. On/Off/Dimming enhanced Room Controllers shall include:
- 1. Real time current monitoring
  - 2. Multiple relay configurations
    - a. One, two or three relays (LMRC-21x series)
    - b. One or two relays (LMRC-22x series)
  - 3. Efficient 250 mA switching power supply
  - 4. Four RJ-45 DLM local network ports with integral strain relief and dust cover
  - 5. One dimming output per relay
    - a. 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)
    - b. Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)
    - c. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.
    - d. The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
    - e. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim.
    - f. Calibration and trim levels must be set per output channel.
    - g. Devices that set calibration or trim levels per controller are not acceptable.
    - h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.
  - 6. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.

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7. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
8. The following dimming attributes may be changed or selected using a wireless configuration tool:
  - a. Establish preset level for each load from 0-100%
  - b. Set high and low trim for each load
  - c. Set lamp burn in time for each load up to 100 hours
9. Override button for each load provides the following functions:
  - a. Press and release for on/off control
  - b. Press and hold for dimming control
10. WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMRC-221, LMRC-222

D. Plug Load Room Controllers shall include:

1. One relay configuration with additional connection for unswitched load
2. Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated).
3. Factory default operation is Auto-on/Auto-off, based on occupancy
4. Real time current monitoring of both switched and un-switched load (LMPL-201 only)
5. Efficient switching power supply
  - a. 150mA (LMPL-101)
  - b. 250mA (LMPL-201)
6. RJ-45 DLM local network ports
  - a. Three RJ-45 ports (LMPL-101)
  - b. Four RJ-45 ports (LMPL-201)
7. WattStopper product numbers: LMPL-101, LMPL-201.

**2.10 DLM LOCAL NETWORK (Room Network)**

- A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.
- B. Features of the DLM local network include:
  1. Plug n' Go® automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
  2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
  3. Push n' Learn® configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
  4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.



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- C. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.
- D. If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.
- E. WattStopper Product Number: LMRJ-Series

**2.11 DLM SEGMENT NETWORK (Room to Room Network)**

- A. The segment network shall be a linear topology, BACnet-based MS/TP subnet to connect DLM local networks (rooms) and LMCP relay panels for centralized control.
  - 1. Each connected DLM local network shall include a single network bridge (LMBC-300), and the network bridge is the only room-based device that is connected to the segment network.
  - 2. Network bridges, relay panels and segment managers shall include terminal blocks, with provisions for separate "in" and "out" terminations, for segment network connections.
  - 3. The segment network shall utilize 1.5 twisted pair, shielded, cable supplied by the lighting control manufacturer. The maximum cable run for each segment is 4,000 feet. Conductor-to-conductor capacitance of the twisted pair shall be less than 30 pf/ft and have a characteristic impedance of 120 Ohms.
  - 4. Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device.
  - 5. Substitution of manufacturer-supplied cable must be pre-approved: Manufacturer will not certify network reliability, and reserves the right to void warranty, if non-approved cable is installed, and if terminations are not completed according to manufacturer's specific requirements.
  - 6. Segment networks shall be capable of connecting to BACnet-compliant BAS (provided by others) either directly, via MS/TP, or through NB-ROUTERS, via BACnet/IP or BACnet/Ethernet. Systems whose room-connected network infrastructure require gateway devices to provide BACnet data to a BAS are unacceptable.
- B. WattStopper Product Number: LM-MSTP, LM-MSTP-DB

**2.12 CONFIGURATION TOOLS**

- A. A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.
- B. Features and functionality of the wireless configuration tool shall include but not be limited to:
  - 1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
  - 2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.

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3. Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number.
4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
8. Verify status of building level network devices.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

**2.13 NETWORK BRIDGE**

- A. The network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, relay panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication and an optically isolated EIA/TIA RS-485 transceiver.
1. The network bridge shall be provided as a separate module connected on the local network through an available RJ-45 port.
  2. Provide Plug n' Go operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
  3. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. BACnet objects will be created for the addition or replacement of any given in-room DLM device for the installed life of the system. Products requiring that an application-specific point database be loaded to create or map BACnet objects are not acceptable. Systems not capable of providing BACnet data for control devices via a dedicated BACnet Device ID and physical MS/TP termination per room are not acceptable. Standard BACnet objects shall be provided as follows:
    - a. Read/write the normal or after hours schedule state for the room
    - b. Read the detection state of each occupancy sensor
    - c. Read the aggregate occupancy state of the room
    - d. Read/write the On/Off state of loads
    - e. Read/write the dimmed light level of loads
    - f. Read the button states of switches
    - g. Read total current in amps, and total power in watts through the room controller
    - h. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
    - i. Activate a preset scene for the room

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- j. Read/write daylight sensor fade time and day and night setpoints
- k. Read the current light level, in footcandles, from interior and exterior photosensors and photocells
- l. Set daylight sensor operating mode
- m. Read/write wall switch lock status
- n. Read watts per square foot for the entire controlled room
- o. Write maximum light level per load for demand response mode
- p. Read/write activation of demand response mode for the room
- q. Activate/restore demand response mode for the room

B. WattStopper product numbers: LMBC-300

**2.14 SEGMENT MANAGER**

- A. For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443).
- B. Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the plans.
- C. Operational features of the Segment Manager shall include the following:
  - 1. Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic.
  - 2. Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser. Shall not require installation of any lighting control software to an end-user PC.
  - 3. Log in security capable of restricting some users to view-only or other limited operations.
  - 4. Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels.
  - 5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
  - 6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.
  - 7. Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays, and assign relays to groups. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation. Support for a minimum of 100 unique schedules, each with up to four time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules.

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8. Ability to group rooms and loads for common control by schedules, switches or network commands.
9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
10. Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control.
11. The Segment Manager shall allow access and control of the overall system database via Native Niagara AX FOX connectivity. Systems that must utilize a Tridium Niagara controller in addition to the programming, scheduling and configuration server are not acceptable.

- D. Segment Manager shall support multiple DLM rooms as follows:
1. Support up to 120 network bridges and 900 digital in-room devices (LMSM-3E).
  2. Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches (LMSM-6E).
- E. WattStopper Product Numbers: LMSM-3E, LMSM-6E, NB-ROUTER, NB-SWITCH, NB-SWITCH-8, NB-SWITCH-16.

**2.15 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE**

- A. PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.
1. Additional parameters exposed through this method include but are not limited to:
    - a. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
    - b. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
    - c. Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.
    - d. Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.
    - e. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
    - f. Load control polarity reversal so that on events turn loads off and vice versa.
    - g. Per-load DR (demand response) shed level in units of percent.
    - h. Load output pulse mode in increments of 1second.

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- i. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.
- 2. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
  - a. Device list report: All devices in a project listed by type.
  - b. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
  - c. BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.
  - d. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
  - e. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.
  - f. Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).
  - g. Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors.
- 3. Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations:
  - a. Set, copy/paste an entire project site of sensor time delays.
  - b. Set, copy/paste an entire project site of sensor sensitivity settings.
  - c. Search based on room name and text labels.
  - d. Filter by product type (i.e. LMRC-212) to allow parameter set by product.
  - e. Filter by parameter value to search for product with specific configurations.
- 4. Network-wide firmware upgrading remotely via the BACnet/IP network.
  - a. Mass firmware update of entire rooms.
  - b. Mass firmware update of specifically selected rooms or areas.
  - c. Mass firmware upgrade of specific products.

B. WattStopper Product Number: LMCS-100, LMCI-100

**2.16 LMCP LIGHTING CONTROL PANELS**

- A. Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:
  - 1. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays.
  - 2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
  - 3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:
    - a. Removable, plug-in terminal blocks with connections for all low voltage terminations.

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- b. Individual terminal block, override pushbutton, and LED status light for each relay.
- c. Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only.
- d. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO modules capable of receiving momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices.
- e. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.
- f. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
- g. Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99.
- h. Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.
- i. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
  - 1) Electrical:
    - a) 30 amp ballast at 277V
    - b) 20 amp ballast at 347V
    - c) 20amp tungsten at 120V
    - d) 30 amp resistive at 347V
    - e) 1.5 HP motor at 120V
    - f) 14,000 amp short circuit current rating (SCCR) at 347V
    - g) Relays shall be specifically UL 20 listed for control of plug-loads
  - 2) Mechanical:
    - a) Replaceable, 1/2" KO mounting with removable Class 2 wire harness.
    - b) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
    - c) Dual line and load terminals each support two #14 - #12 solid or stranded conductors.
    - d) Tested to 300,000 mechanical on/off cycles.
- 4. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
- 5. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.
- 6. Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon loss of normal power. Panels shall

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- be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 - Article 700.
7. Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control.
    - a. Each panel shall include digital clock capability able to issue system wide automation commands to up to (11) eleven other panels for a total of (12) twelve networked lighting control panels. The clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups.
    - b. The clock capability of each panel shall support the time-based energy saving requirements of applicable local energy codes.
    - c. The clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for the clock function and program retention in non-volatile FLASH memory. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed.
    - d. The clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
      - 1) Scheduled ON / OFF
      - 2) Manual ON / Scheduled OFF
      - 3) Astro ON / OFF (or Photo ON / OFF)
      - 4) Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
    - e. The user interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)
    - f. The clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years.
    - g. Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable.
  8. The lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions, as configured in a Segment Manager controller, via a segment network connection.
  9. The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet® protocol.
    - a. The panel shall have provision for an individual BACnet device ID and shall support the full 2<sup>22</sup> range (0 – 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network.
    - b. The panel shall support MS/TP MAC addresses in the range of 0 – 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second.
    - c. Lighting control relays shall be controllable as binary output objects in the instance range of 1 – 64. The state of each relay shall be readable and writable by the BAS via the object present value property.
    - d. Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 – 64.

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- e. The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 – 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode.
  - f. Setup and commissioning of the panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:
    - 1) Binary output objects in the instance range of 1 – 64 (one per relay) for on/off control of relays.
    - 2) Binary value objects in the instance range of 1 – 99 (one per channel) for normal hours/after hours schedule control.
    - 3) Binary input objects in the instance range of 1 – 64 (one per relay) for reading true on/off state of the relays.
    - 4) Analog value objects in the instance range of 101 – 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.
  - g. The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.
  - h. The BO and BV 1 – 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa. (<http://www.bacnet.org/Addenda/Add-135-2010aa.pdf>)
  - i. Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object.
  - j. Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196.
10. WattStopper Product Number: LMCP8, LMCP24 or LMCP48

**2.17 USER INTERFACE**

- A. Each lighting control panel system shall be supplied with at least (1) handheld configuration tool (LMCT-100). As a remote programming interface the configuration tool shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following panel-specific functions as a minimum:
  - 1. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
  - 2. Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven



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parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.

3. Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.
4. Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.
5. Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.
6. Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.
7. An additional handheld IR remote may optionally be specified to be permanently mounted to the panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel while assuring that the handheld programmer is always present at that panel. An unlimited number of handheld IR remotes may also be purchased for facilities staff as determined by the end user's representative.

B. WattStopper Product Number: LMCT-100

**2.18 EMERGENCY LIGHTING CONTROL DEVICES**

- A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
1. 120/277 volts, 50/60 Hz, 20 amp ballast rating
  2. Push to test button
  3. Auxiliary contact for remote test or fire alarm system interface

B. WattStopper Product Numbers: ELCU-100, ELCU-200.

**PART 3 - EXECUTION**

**3.1 PRE-INSTALLATION MEETING**

- A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:
1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.
  2. Review the specifications for low voltage control wiring and termination.

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3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
4. Discuss requirements for integration with other trades.

**3.2 EXAMINATION**

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.3 SENSOR INSTALLATION**

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

**3.4 CONTACTOR INSTALLATION**

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

**3.5 WIRING INSTALLATION**

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch (13 20 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

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**3.6 IDENTIFICATION**

- A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

**3.7 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

**3.8 FACTORY SERVICES**

- A. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.
- B. The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date.
- C. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

**3.9 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
  - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

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- 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
- 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

**3.10 ACCEPTANCE TESTING SUPPORT SERVICES**

- A. On all California projects, a certified lighting controls acceptance test technician (CLCATT) must verify the installation of the lighting control system. Manufacturer should include an extra day of factory technician's time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms. It will be the CLCATT's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the CLCATT with this task.

**3.11 COMMISSIONING SUPPORT SERVICES**

- A. On this project, a commissioning agent will be hired to verify the installation and programming of all building systems, which includes the lighting control system. Manufacturer should include an extra day of technician's time to review the functionality and settings of the lighting control hardware with the commissioning agent, including reviewing submittal drawings and ensuring that instructions on how to configure each device are readily available. Manufacturer is NOT responsible for helping the commissioning agent inspect the individual devices. It will be the commissioning agent's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the agent with this task.
- B. The commissioning agent shall work with the electrical contractor during installation of the lighting control hardware to become familiar with the specific products. The agent may also accompany the manufacturer's technicians during their start-up work to better understand the process of testing, calibration and configuration of the products. However, the contractor and manufacturer shall ensure that interfacing with the agent does not prevent them from completing the requirements outlined in the contract documents.

**3.12 SOFTWARE SERVICE AGREEMENT**

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within [two] <Insert number> years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
  - 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

**3.13 DEMONSTRATION**

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in

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Section 26 09 43.16 "Addressable-Luminaire Lighting Controls" and  
Section 26 09 43.23 "Relay-Based Lighting Controls."

- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

**END OF SECTION**

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**SECTION 262100  
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Electrical service requirements.

**1.2 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

**1.3 PRICE AND PAYMENT PROCEDURES**

- A. Allowances:
  - 1. See Section 012100 - Allowances, for allowances affecting this section.
  - 2. Include cash allowance for Utility Company charges associated with providing service.

**1.4 DEFINITIONS**

**1.5 REFERENCE STANDARDS**

- A. IEEE C2 - National Electrical Safety Code(R) (NEC(R)) 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.6 ADMINISTRATIVE REQUIREMENTS**

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
  - 1. Verify the following with Utility Company representative:
    - a. Utility Company requirements, including division of responsibility.
    - b. Exact location and details of utility point of connection.
    - c. Utility easement requirements.
    - d. Utility Company charges associated with providing service.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
  - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.

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4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
  1. Arrange for inspections necessary to obtain Utility Company approval of installation.

**1.7 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
  1. Obtain Utility company approval of shop drawings prior to submittal.
- C. Drawings prepared by Utility Company.
- D. Project Record Documents: Record actual locations of equipment and installed service routing.

**1.8 QUALITY ASSURANCE**

- A. Comply with the following:
  1. IEEE C2 (National Electrical Safety Code).
  2. NFPA 70 (National Electrical Code).
  3. The requirements of the Utility Company.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

**PART 2 PRODUCTS**

**2.1 ELECTRICAL SERVICE REQUIREMENTS**

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.

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- C. Electrical Service Characteristics:
  - 1. Service Type: Underground.
  - 2. Service Voltage: 240/120 V, 1 phase, 60 Hz.
- D. Utility Company: As indicated on drawings.
- E. Division of Responsibility: As indicated on drawings.
- F. Products Furnished by Contractor: Comply with Utility Company requirements.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 PREPARATION**

**3.3 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 312316.13.
- E. Provide required support and attachment components in accordance with Section 260529.
- F. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.
- G. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

**3.4 PROTECTION**

- A. Protect installed equipment from subsequent construction operations.

**END OF SECTION**



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**SECTION 262413  
SWITCHBOARDS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

**1.2 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
  - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- G. Section 011813 Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NEMA PB 2 - Deadfront Distribution Switchboards 2011.
- G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less 2013.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- K. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.
- L. UL 891 - Switchboards Current Edition, Including All Revisions.

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**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
  - 1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
  - 2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
  - 3. Obtain Utility Company approval of switchboard prior to fabrication.
  - 4. Arrange for inspections necessary to obtain Utility Company approval of installation.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
  - 2. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.
- F. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

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**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

**1.8 FIELD CONDITIONS**

- A. Maintain field conditions within required service conditions during and after installation.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. Switchboards - Basis of Design: Schneider Electric, Square D .
- B. Switchboards - Other Acceptable Manufacturers:
  - 1. ABB/GE: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  - 2. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  - 3. Siemens Industry, Inc: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
- C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- D. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.2 SWITCHBOARDS**

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Front-Connected Switchboards:
  - 1. Main Device(s): Individually-mounted.
  - 2. Feeder Devices: Panel/group-mounted.
  - 3. Arrangement: Front accessible only (not rear accessible), rear aligned.
  - 4. Gutter Access: Bolted covers.
- E. Service Entrance Switchboards:
  - 1. Listed and labeled as suitable for use as service equipment according to UL 869A.

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2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
  3. Comply with Utility Company requirements for electrical service.
  4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.
- F. Seismic Qualification: Provide switchboards and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.
- G. Service Conditions:
1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude: Less than 6,600 feet (2,000 m).
    - b. Ambient Temperature:
      - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
  2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- H. Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
  2. Minimum Rating: 22,000 rms symmetrical amperes.
- I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- J. Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
  2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  4. Phase and Neutral Bus Material: Copper.
  5. Ground Bus Material: Copper.
- K. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Line Conductor Terminations:
    - a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
    - b. Main and Neutral Lug Type: Mechanical.
  2. Load Conductor Terminations:
    - a. Lug Material: Copper, suitable for terminating copper conductors only.
    - b. Lug Type:
      - 1) Provide mechanical lugs unless otherwise indicated.

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- L. Enclosures:
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 2. Finish: Manufacturer's standard unless otherwise indicated.
- M. Future Provisions:
  - 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- N. Instrument Transformers:
  - 1. Comply with IEEE C57.13.
  - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
  - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
  - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

### **2.3 OVERCURRENT PROTECTIVE DEVICES**

- A. Circuit Breakers:
  - 1. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - 2. Molded Case Circuit Breakers:
    - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
    - b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      - 1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

### **2.4 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
  - 1. Dielectric tests.
  - 2. Mechanical operation tests.
  - 3. Grounding of instrument transformer cases test.
  - 4. Electrical operation and control wiring tests, including polarity and sequence tests.
  - 5. Ground-fault sensing equipment test.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

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- C. Verify that mounting surfaces are ready to receive switchboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch (10 mm) between switchboard and wall.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Install all field-installed devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Provide filler plates to cover unused spaces in switchboards.
- L. Identify switchboards in accordance with Section 260553.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.1.
- E. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- F. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- G. Correct deficiencies and replace damaged or defective switchboards or associated components.

**3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

**3.5 CLOSEOUT ACTIVITIES**

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

**3.6 PROTECTION**

- A. Protect installed switchboards from subsequent construction operations.

**END OF SECTION**

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**SECTION 262416  
PANELBOARDS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.2 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
  - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 - Panelboards 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 67 - Panelboards Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- M. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

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**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  - 2. Identify mounting conditions required for equipment seismic qualification.
- C. Manufacturer's equipment seismic qualification certification.
- D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

**1.8 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).



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**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. ABB/GE: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- D. Siemens Industry, Inc: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.2 PANELBOARDS - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
  - 2. Listed series ratings are not acceptable.
- E. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- F. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- G. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- H. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.

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3. Fronts:
  - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
  - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
  - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

**2.3 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  1. Phase and Neutral Bus Material: Copper.
  2. Ground Bus Material: Copper.
- D. Circuit Breakers:
  1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
  2. Provide thermal magnetic circuit breakers unless otherwise indicated.
- E. Enclosures:
  1. Provide surface-mounted enclosures unless otherwise indicated.
  2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  3. Provide clear plastic circuit directory holder mounted on inside of door.

**2.4 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  2. Phase and Neutral Bus Material: Copper.
  3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  1. Provide surface-mounted or flush-mounted enclosures as indicated.

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2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

**2.5 OVERCURRENT PROTECTIVE DEVICES**

**A. Molded Case Circuit Breakers:**

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
  - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
  - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

**2.6 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.

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- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 260573.
- N. Provide filler plates to cover unused spaces in panelboards.
- O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Emergency and night lighting circuits.
  - 2. Fire detection and alarm circuits.
  - 3. Communications equipment circuits.
  - 4. Intrusion detection and access control system circuits.
  - 5. Video surveillance system circuits.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- D. Correct deficiencies and replace damaged or defective panelboards or associated components.

**3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.5 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

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**SECTION 262726  
WIRING DEVICES**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Wall switches.
- B. Fan speed controllers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.

**1.2 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units Current Edition, Including All Revisions.
- M. UL 1917 - Solid-State Fan Speed Controls Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:

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1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

**1.7 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

**PART 2 PRODUCTS**

**2.1 WIRING DEVICE APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.

**2.2 WIRING DEVICE FINISHES**

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- E. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

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**2.3 WALL SWITCHES**

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with decorator style rocker type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

**2.4 FAN SPEED CONTROLLERS**

- A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
  - 1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

**2.5 RECEPTACLES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Automatically Controlled Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
  - 3. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
  - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
  - 2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  - 3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as

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weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

- E. USB Charging Devices:
  - 1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
    - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
    - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.

**2.6 WALL PLATES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com/#sle](http://www.hubbell-wiring.com/#sle).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

**2.7 FLOOR BOX SERVICE FITTINGS**

- A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.
- B. Flush Floor Service Fittings:
  - 1. Single Service Flush Convenience Receptacles:
    - a. Cover: Rectangular.
    - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.



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**3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

**3.3 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
  - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
  - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. Identify wiring devices in accordance with Section 260553.

**3.4 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.

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- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

**3.5 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**3.6 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

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**SECTION 262816.13  
ENCLOSED CIRCUIT BREAKERS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Enclosed circuit breakers.

**1.2 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
  - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

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3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted enclosed circuit breakers where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Project Record Documents: Record actual installed locations of enclosed circuit breakers.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

**1.8 FIELD CONDITIONS**

- A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. ABB/GE: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- D. Siemens Industry, Inc: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).

**2.2 ENCLOSED CIRCUIT BREAKERS**

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

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- C. Seismic Qualification: Provide enclosed circuit breakers and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.
- D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- E. Short Circuit Current Rating:
  - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
- F. Conductor Terminations: Suitable for use with the conductors to be installed.
- G. Provide thermal magnetic circuit breakers unless otherwise indicated.
- H. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
  - 3. Provide surface-mounted enclosures unless otherwise indicated.
- J. Provide externally operable handle with means for locking in the OFF position.

**2.3 MOLDED CASE CIRCUIT BREAKERS**

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
  - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
  - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
  - 1. Lug Material: Copper, suitable for terminating copper conductors only.
- D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
- E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

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- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Identify enclosed circuit breakers in accordance with Section 260553.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.
- D. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

**3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.5 CLEANING**

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

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**SECTION 262816.16  
ENCLOSED SWITCHES**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.2 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.
- F. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

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**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

**1.8 FIELD CONDITIONS**

- A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. ABB/GE: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- D. Siemens Industry, Inc: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
- E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.2 ENCLOSED SAFETY SWITCHES**

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Seismic Qualification: Provide enclosed safety switches suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.
- D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:



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1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- E. Horsepower Rating: Suitable for connected load.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Short Circuit Current Rating:
  1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- M. Heavy Duty Switches:
  1. Comply with NEMA KS 1.
  2. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.

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- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Identify enclosed switches in accordance with Section 260553.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

**3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.5 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

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**SECTION 26 3100  
PHOTOVOLTAIC & BATTERY SYSTEM**

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**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. The work of this Section consists of providing photovoltaic panels, wiring, inverters, batteries, and controls as shown on the Drawings and as described herein. The system shall include all required components for a fully operational, grid tied system, to convert sunlight into AC electrical power and provide backup power whether or not specified herein. System shall comply with all utility company requirements for grid tied systems.

**1.2 RELATED WORK:**

- A. See the following specification sections for work related to the work in this Section:
1. Section 26 0519 – Electrical Power Conductors and Cables
  2. Section 26 2816 – Enclosed Switches and Circuit Breakers
  3. Section 26 0526 – Grounding and Bonding for Electrical Systems

**1.3 STANDARDS AND CODES:**

- A. Work and materials shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
1. California Electrical Code (CEC)
  2. Institute of Electrical and Electronics Engineers (IEEE):
    - a. IEEE 519 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
    - b. IEEE 929 Recommended Practice for Utility Interface of Residential and Intermediate Photovoltaic (PV) Systems
  3. National Electrical Manufacturers Association (NEMA):
    - a. Type 3R for outdoor use primarily to provide a degree of protection against falling rain, sleet, and external ice formation
  4. Underwriters Laboratories (UL):
    - a. 1741 Inverters, Converters, and Controllers for Use in Independent Power Systems.

**1.4 SUBMITTALS:**

- A. As specified in the Owner's Bidding Instructions.
- B. Shop Drawings: Per the Owner's Bidding Instructions or per Electrical Engineer's requirements. Submit manufacturer's descriptive literature and a shop drawing indicating all required components for a fully functioning system.

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- C. Single Submittal: A single complete submittal is required for all products covered by this Section.
- D. Closeout Submittals: Submit operation and maintenance manuals for photovoltaic system. Include list of all components and contact information for a local factory authorized maintenance company.

**1.5 WARRANTY:**

- A. Manufacturer shall warrant photovoltaic solar cells against defects in workmanship and material for a period of 20 years.
- B. Photovoltaic module shall be provided with a manufacturer 25-year limited power warranty and a 10-year limited product warranty.
- C. Manufacturer shall warrant photovoltaic inverter against defects in workmanship and material
- D. Photovoltaic inverter shall be provided with a 10-year manufacturer warranty against defects in workmanship and material with extend option to extend to 20 years.
- E. PV Monitoring System Manufacturer shall provide monitoring service, feature upgrades, and warrant monitoring system against defects in workmanship and material for a period of 5 years.

**1.6 QUALIFICATIONS:**

- A. The contractor shall have at least 3 years' experience successfully installing 3-phase, grid tied, photovoltaic systems of similar type and design and be a California licensed Electrical Contractor or shall have a contractual agreement with a subcontractor having such qualifications to do the work.
- B. Prior to commencement of installation, submit data for review including: A list of five projects completed by installing contractor with photovoltaic module manufacturer, photovoltaic inverter manufacturer, and monitoring system manufacturer, system capacity (kW - DC) and owner reference for each project with contact information.

**PART 2 - PRODUCTS**

**2.1 PHOTOVOLTAIC MODULE – ROOF MOUNTED ROOF SYSTEMS**

- A. General: Photovoltaic Modules shall be crystalline heterojunction type (or similar) solar cells with average 20.7% conversion efficiency. Modules shall be 68.1 inches by 44.0 inches and 1.2 inches thick; and weigh 47.5 pounds.
- B. Solar cells shall be encapsulated between a tempered glass cover and an EVA pottant with back sheet installed into an anodized aluminum frame.

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- C. Each module shall be rated 400 W and shall be rated at 48.8 VDC maximum power voltage, 58.9 VDC open circuit voltage, 8.20 A DC maximum power current, and 8.73 A DC maximum short circuit current at Standard Test Conditions (STC).
- D. Manufacturer: REC Solar 400 W REC ALPHA PURE-R SERIES or approved equal.
- E. Acceptable Alternative PV Module Manufacturers: SunPower, QCELLS, Solaria, or Reviewed and Approved Equal.

**2.2 DC OPTIMIZER SYSTEM**

- A. Contractor shall provide and install a DC Optimizer System with the PV system.
- B. Manufacturer: SolarEdge – Refer to Specifications Sections 26 31 00.10

**2.3 ROOF TOP RACKING SYSTEM**

- A. Contractor shall provide and install a flush mount racking system for photovoltaic modules on a sloped roof. Contractor shall install racking system per manufacturer's specifications and installation guide and provide and install all parts and pieces necessary for a fully functional racking system.
- B. Manufacturer: IronRidge Sloped Roof Racking System or reviewed and approved equal
- C. Acceptable Alternative Manufacturers: UniRac, SunModo, or reviewed and approved equal

**2.4 PHOTOVOLTAIC & BATTERY INVERTER 6 KW**

- A. General: Provide a utility interactive, 3 phase Inverter to convert DC power from the photovoltaic solar cells and or a battery system to AC power.
- B. Inverter shall provide over- and under-voltage and frequency protection shutting down inverter in compliance with UL 1741, and anti-islanding protection to prevent feedback of power onto the grid during a utility outage.
- C. Inverter shall be capable of accepting up to two (2) batteries with a maximum capacity of 20 kWh and maximum battery system DC Input Current of 18 A at 240V.
- D. Maximum DC system voltage shall be 480 VDC. DC nominal operating voltage shall be 400 VDC. Maximum DC input current shall be 16.5 A from the PV system.
- E. Output shall be 240 VAC, 60 Hz, 6 kW. AC operating range shall be 211 to 264 V. AC frequency shall be 59.3 to 60.5 Hz. Maximum output current shall be 25 amps AC.
- F. Inverter shall operate within an ambient temperature range of between -40°F and 140°F. Enclosure shall be NEMA 4X type. Night-time power consumption shall be no more than 3 W.

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- G. Inverter shall have a maximum efficiency of 99.2%CEC Weighted Efficiency of 99.
- H. Unit shall automatically turn on when power increases above losses (night/day operation). Unit shall track power and compensate for cloud cover.
- I. Provide RS485 interface.
- J. Manufacturer: SolarEdge SE6000H-US or reviewed and approved equal.

**2.5 PHOTOVOLTAIC & BATTERY INVERTER 7.6 KW**

- A. General: Provide a utility interactive, 3 phase Inverter to convert DC power from the photovoltaic solar cells and or a battery system to AC power.
- B. Inverter shall provide over- and under-voltage and frequency protection shutting down inverter in compliance with UL 1741, and anti-islanding protection to prevent feedback of power onto the grid during a utility outage.
- C. Inverter shall be capable of accepting up to two (2) batteries with a maximum capacity of 20 kWh and maximum battery system DC Input Current of 18 A at 240V.
- D. Maximum DC system voltage shall be 480 VDC. DC nominal operating voltage shall be 400 VDC. Maximum DC input current shall be 20 A from the PV system.
- E. Output shall be 240 VAC, 60 Hz, 7.6 kW. AC operating range shall be 211 to 264 V. AC frequency shall be 59.3 to 60.5 Hz. Maximum output current shall be 32 amps AC.
- F. Inverter shall operate within an ambient temperature range of between -40°F and 140°F. Enclosure shall be NEMA 4X type. Night-time power consumption shall be no more than 3 W.
- G. Inverter shall have a maximum efficiency of 99.2%CEC Weighted Efficiency of 99.
- H. Unit shall automatically turn on when power increases above losses (night/day operation). Unit shall track power and compensate for cloud cover.
- I. Provide RS485 interface.
- J. Manufacturer: SolarEdge SE7600H-US or reviewed and approved equal.

**2.6 BACKUP INTERFACE**

- A. Contractor shall provide and install all parts and pieces necessary for a fully functional PV and Battery system that has the capabilities to perform peak shaving and/or energy arbitrage or similar functions and backup power micro-grid capabilities.
- B. The Backup Interface shall have a built-in Auto Transformer and energy meter and be capable of integrating and managing PV and Battery Inverters and a generator. The Backup Interface shall also be capable of connecting a 15KW generator and have the ability to add up (3) Three 40A Circuit Breakers for PV and Battery Inverters.

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- C. The Backup Interface shall be in compliance with UL1741 and UL869A.
- D. The Backup Interface shall operate within an ambient temperature range of between -40°F and 122°F. Enclosure for Backup Interface shall be NEMA 3R with IP44 listing.
- E. Main Circuit Breaker for Backup Interface: Circuit breaker shall be service entrance rated and shall be electronically operated. Main circuit breaker shall be compatible with microgrid controls. Backup Interface shall also be able to communicate through RS485 communication.
- F. Backup Interface: Manufacturer: SolarEdge BI-EUSGN-02 or Reviewed and Approved Equal.

**2.7 BATTERY**

- A. General: Provide Lithium-Ion type battery, with AC interconnection voltage of 240 V 1 PH, rated at 10 kWh and a useable energy storage rating of 9.7 kWh. See drawings for quantity and locations of batteries.
- B. Battery maximum continuous power output shall be 5 kW and a peak power output of 7.5 KW for 10 seconds. The operating voltage range shall be 350 to 450 VDC for Charging and 350 to 450 VDC for Discharging.
- C. Enclosure shall be NEMA 3R type for the Battery cabinet with an IP55 rating. Batteries shall be for backup power applications and be able to communicate through RS485 communication.
- D. Batteries shall operate within an ambient temperature range of 14 deg F to 122 deg F.
- E. Batteries shall be in compliance with UL1642 (Cell), UL1973 (Battery Pack), and have a Class 9 Hazardous Materials Certification.
- F. Manufacturer: SolarEdge BAT-10K1P or reviewed and approved equal.

**2.8 PERFORMANCE METER**

- A. The system shall include a California Energy Commission approved performance meter, per utility company requirements.

**2.9 MONITORING SYSTEM**

- A. The system shall include all materials and labor required to provide a complete photovoltaic and battery monitoring system, including California Energy Commission approved performance meter, data loggers, current transducers, environmental sensors, etc., to display the benefits of the of the PV installation.
- B. The system shall be a remote, real-time, web-based, solar electric and battery system monitoring system capable of recording and transmitting real time and historical solar and battery system performance data. Solar electric and battery system performance

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data will be collected locally from the system, and then transmitted via the Internet to a centralized database. Data shall be accessible from any device with a web browser, including PCs.

- C. System shall display at a minimum:
  - 1. Instantaneous AC voltage, current and power
  - 2. Instantaneous DC voltage, current and power
  - 3. Cumulative AC and DC energy generation
  - 4. Sun Irradiance
  - 5. Wind Speed and direction
  - 6. Ambient temperature and cell temperature
  - 7. Battery System available capacity in kWh and in usable remaining %.
  - 8. Estimate Duration of Battery System in hours.
  
- D. In addition to monitoring data, the system shall provide fault notification, and provide well-designed real time displays that are useful for educational purposes.
  
- E. Manufacturer: SolarEdge or reviewed and approved equal.

**2.10 MICROGRID CONTROL SYSTEM**

- A. The microgrid control system shall include all materials and labor required to provide a complete and islandable microgrid system including data cables, islanding controllers, microgrid controllers, and site master controllers.
  
- B. Manufacturer: SolarEdge or reviewed and approved equal.

**2.11 SEQUENCE OF OPERATION:**

- A. System Summary: The microgrid controls shall allow the solar and storage system to be islandable in the case of a utility power outage and back up the respective loads as indicated on the Construction Documents. The microgrid controls shall adjust the amount of energy reserved for backup power on a monthly basis and use additional capacity of battery for energy arbitrage. Refer to sheet PV6.2 for additional information for the sequence of operation.
  
- B. Normal Operation / Normal Grid Tied Operation: Utility grid connection is available and the solar provides enough energy to offset utility import. The Microgrid control system allows the Battery Energy Storage System (BESS) to run in parallel with grid in grid-tied mode. This allows the microgrid to leverage the battery as a resource to help offset utility usage in situations where it is economically beneficial.
  
- C. Utility Power Outage / Islanded Microgrid Operation: The open transition islanding sequence of operation shall follow a standard template in which the following parameters shall be upheld for maximum stability of the site:
  - 1. Fault detected from utility grid.
  - 2. Main breaker and all required Distributed Energy Resources (DER) breakers (i.e. PV and Battery breakers) open.  
Site load remains disconnected from utility and waits (3) (configurable time) minutes to satisfy dwelling requirements.

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3. If utility stays off for (180) seconds, open required controllable load breakers and BESS becomes anchor resource.
  4. BESS output breaker and/or inverter closes to dead bus.
  5. Critical loads brought online.
  6. PV output breaker and/or inverter closes to the microgrid system.
  7. The sequence of loads energized are predetermined and managed by closing load breakers automatically up to maximum desired load, or available generation and BESS capacity.
  8. BESS will charge up to the maximum state-of-charge when excess energy is available from PV production.
  9. If PV output cannot meet load requirements, BESS will discharge to meet remaining loads until reaching its minimum state-of-charge.
  10. Once the BESS reaches its minimum state-of-charge, and if temporary generation is not present, system trips offline.
  11. The microgrid controller monitors the utility breaker for a return of utility power, or a predefined state of charge on the BESS.
  12. The microgrid controller operates continuously and optimizes the PV and BESS for the following parameters: load target, desired state-of-charge.
  13. In case of a disturbance, revert back to life-safety system to be powered only.
  14. Assumes that BESS is capable of handling the site load for power stability.
- D. Return to Normal Mode:
1. Open Transition to Normal Mode:
    - Detect utility return for (10) minutes to ensure stability.
    - Open PV breaker and /or shut off inverter output.
    - Open BESS breaker and/or shut off inverter output.
    - Open the load breakers, if applicable.
    - Close the utility breaker to re-energize the dead bus.
    - Close load breakers to the grid, if applicable.
    - Bring PV and BESS back online by reclosing the PV and BESS breakers and activating inverter output, as required by local codes and regulations.
- E. Note that manual load preservation or load shedding undertaken by the end user, at any time during the sequence of operations, adds significant operator responsibility and can cause a system to perform at level that will not achieve the end user's desired system duration.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install all components in accordance with the manufacturer's instructions.
- B. Contractor shall be certified by the manufacturer to field install photovoltaic modules and inverters.

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**3.2 FIELD TESTS**

- A. Complete testing of the installed system shall be performed by a factory-certified representative prior to system start up. All required modifications shall be made and system signed off.
- B. Grounding: Grounding shall conform to Section 26 05 26.

**3.3 UTILITY INTERCONNECT**

- A. Contractor shall coordinate with the utility company to provide all grid intertie requirements and process all required paper work per utility company requirements.

**END OF SECTION**

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**SECTION 263100.10  
PHOTOVOLTAIC ENERGY POWER OPTIMIZER SYSTEM**

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**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. The work of this Section consists of providing photovoltaic energy power optimizer system, as shown on the Drawings and as described herein, to maximize the AC electrical power conversion efficiency of a photovoltaic inverter and total net annual energy production of a photovoltaic system, provide the ability to deactivate the DC output of the system adjacent to each photovoltaic module for safety purposes.
- B. Each system shall include all required components including all cabling, module maximizer, wireless gateways, management units and software to maximize the AC output of a photovoltaic array. The contractor shall provide all components required for a fully operational system whether or not specified herein. System shall comply with all utility company requirements for grid tied photovoltaic systems.

**1.2 RELATED WORK:**

- A. See the following specification sections for work related to the work in this Section:
  - 1. Section 26 3100 – Photovoltaic System
  - 2. Section 26 0526 – Grounding and Bonding for Electrical Systems

**1.3 STANDARDS AND CODES:**

- A. Work and materials shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
  - 1. California Electrical Code (CEC)
  - 2. Equipment shall be Underwriters Laboratory (UL) listed.

**1.4 SUBMITTALS:**

- A. As specified in the Owner's Bidding Instructions.
- B. Shop Drawings: As specified in the Owner's Bidding Instructions or per Electrical Engineer's requirements. Submit manufacturer's descriptive literature and a shop drawing indicating all required components for a fully functioning system.
- C. Single Submittal: A single complete submittal is required for all products covered by this Section.

	263100.10 - 1	Power Optimizer System
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- D. Closeout Submittals: Submit operation and maintenance manuals for photovoltaic system. Include list of all components and contact information for a local factory authorized maintenance company.

**1.5 WARRANTY:**

- A. Manufacturer shall warrant the Power Optimizers against defects in material or workmanship for a period of 25 years.

**1.6 QUALIFICATIONS:**

- A. The contractor shall have at least 3 years' experience successfully installing 3-phase, grid tied, photovoltaic systems of similar size, type and design and be a California licensed Electrical Contractor or shall have a contractual agreement with a subcontractor having such qualifications to do the work.
- B. Prior to commencement of installation, submit data for review including: A list of five projects completed by installing contractor with photovoltaic module manufacturer, photovoltaic inverter manufacturer, and monitoring system manufacturer, system capacity (kW – DC) and owner reference for each project with contact information.

**PART 2 - PRODUCTS**

**2.1 POWER OPTIMIZER (PO):**

- A. Provide one Power Optimizer (PO) per Photovoltaic Module. PO shall be designed to be attached to PV racking system. PO shall be rated NEMA 6P. Unit shall be provided with properly sized leads to connect the unit to its associated Photovoltaic Module and the next unit in the string with a minimum of extra wiring. Match unit with Photovoltaic Module properties per manufacturer's recommendation.
- B. Operating Characteristics

<b>Input Data</b>	<b>P320</b>	<b>P370</b>	<b>P400</b>	<b>P401</b>	<b>P405</b>
Maximum Power	320W	370W	400W	400W	405W
Max Input DC Voltage (Voc)	48V	60V	80V	60V	125V
Vmp Range	8-48V	8-60V	8-80V	8-60V	12.5-105V
Maximum DC Input Current	13.75A	13.75A	12.63A	12.63A	12.63A
Maximum Input Current (Isc)	11A	11A	10.1A	11.75A	10.1A

<b>Output Data</b>	<b>P320</b>	<b>P370</b>	<b>P400</b>	<b>P401</b>	<b>P405</b>
Maximum Output Power	320W	370W	400W	400W	405W

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Maximum Cont. Current (Imp)	15A	15A	15A	15A	15A
Maximum Output Voltage	60V	60V	60V	60V	85V

<b>Mechanical Data</b>	
Operating Temperature Range	-40 deg C to +85 deg C
Cooling	Natural convection
Enclosure Rating	NEMA 6P, IP-68

- C. PO shall use Maximum Power Point Tracking (MPPT) at the module level to actively manage power output. Each power optimizer shall transmit module performance data over the DC power line to the inverter.
- D. PO shall allow disconnection the associated photovoltaic module from the system for safety purposes during following cases:
  - 1. During fault conditions
  - 2. The power optimizers are disconnected from the inverter
  - 3. The inverter's ON/OFF switch is turned OFF
  - 4. The AC/DC Safety Switch is turned OFF
  - 5. Inverter's AC breaker is turned OFF
- E. Manufacturer: SolarEdge – Module Add-On series or approved equal.
- F. Acceptable Alternative Manufacturers: TIGO Energy, Maxim Integrated, or Reviewed and Approved Equal. If the Contractor submits an alternative solution than a system with SolarEdge DC Optimizers, Contractor shall submit a full set of shop drawings, data sheets, and pricing information for the system in design documents and the alternative system during the bidding phase of the project.

**2.2 DUAL POWER OPTIMIZER (DPO):**

- A. Provide one Dual Power Optimizer (DPO) per two Photovoltaic Modules. DPO shall be designed to be attached to PV racking system. DPO shall be rated NEMA 6P. Unit shall be provided with properly sized leads to connect the unit to its associated Photovoltaic Module and the next unit in the string with a minimum of extra wiring. Match unit with Photovoltaic Module properties per manufacturer's recommendation.

**B. Operating Characteristics**

<b>Input Data</b>	<b>P730</b>	<b>P800P</b>	<b>P850</b>	<b>P860</b>
Maximum Power	730W	800W	850W	860W
Max Input DC Voltage (Voc)	125V	87V	120V	60V
Vmp Range	12.5-105V	12.5-87V	12.5-105V	12.5-60V
Maximum DC Input Current	13.75A	8.75A	15.63A	22A
Maximum Input Current (Isc)	11A	7A	12.5A	11A

<b>Output Data</b>	<b>P730</b>	<b>P800P</b>	<b>P850</b>	<b>P860</b>
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Maximum Cont. Current (Imp)	15A	18A	18A	18A
Maximum Output Voltage	85V	85V	85V	85V

<b>Mechanical Data</b>	
Operating Temperature Range	-40 deg C to +85 deg C
Cooling	Natural convection
Enclosure Rating	NEMA 6P, IP-68

- C. PO shall use Maximum Power Point Tracking (MPPT) at the module level to actively manage power output. Each power optimizer shall transmit module performance data over the DC power line to the inverter.
- D. PO shall allow disconnection the associated photovoltaic module from the system for safety purposes during following cases:
  - 1. During fault conditions
  - 2. The power optimizers are disconnected from the inverter
  - 3. The inverter's ON/OFF switch is turned OFF
  - 4. The AC/DC Safety Switch is turned OFF
  - 5. Inverter's AC breaker is turned OFF
- E. Manufacturer: SolarEdge – Module Add-On series or approved equal.
- F. Acceptable Alternative Manufacturers: TIGO Energy, Maxim Integrated, or Reviewed and Approved Equal. If the Contractor submits an alternative solution than a system with SolarEdge DC Optimizers, Contractor shall submit a full set of shop drawings, data sheets, and pricing information for the system in design documents and the alternative system during the bidding phase of the project.

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

- A. Install all components in accordance with the manufacturer's instructions.

**3.2 FIELD TESTS:**

- A. Complete testing of the installed system shall be performed by a factory-certified representative prior to system start up. All required modifications shall be made and system signed off.

**3.3 UTILITY INTERCONNECT:**

- A. Contractor shall coordinate with the utility company to provide all grid intertie requirements per utility company requirements.

**END OF SECTION**

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**SECTION 265100  
INTERIOR LIGHTING**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.

**1.2 RELATED REQUIREMENTS**

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.
- E. Section 265600 - Exterior Lighting.
- F. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.
- C. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.
- D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.
- H. UL 1598 - Luminaires Current Edition, Including All Revisions.
- I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

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2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  1. Provide photometric calculations where luminaires are proposed for substitution.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
- D. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

**1.8 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**1.9 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.
- C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.
- D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

**PART 2 PRODUCTS**

**2.1 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.



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**2.2 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- H. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

**2.3 EMERGENCY LIGHTING UNITS**

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
  - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

**2.4 EXIT SIGNS**

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
  - 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
  - 1. Self-Powered Exit Signs:
    - a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for

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minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

- b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.
- c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- d. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- e. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

**3.3 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- G. Recessed Luminaires:
  - 1. Install trims tight to mounting surface with no visible light leakage.
  - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

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- 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Suspended Luminaires:
  - 1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
- I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- J. Install accessories furnished with each luminaire.
- K. Bond products and metal accessories to branch circuit equipment grounding conductor.
- L. Emergency Lighting Units:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- M. Exit Signs:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
  - 2. Install lock-on device on branch circuit breaker serving units.
- N. Install lamps in each luminaire.

**3.4 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

**3.5 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

**3.6 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

**3.7 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

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**SECTION 265600  
EXTERIOR LIGHTING**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.

**1.2 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 262726 - Wiring Devices: Receptacles for installation in poles.
- E. Section 265100 - Interior Lighting.
- F. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1598 - Luminaires Current Edition, Including All Revisions.
- G. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Provide photometric calculations where luminaires are proposed for substitution.

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- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
- D. Field Quality Control Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

**1.8 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.1 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

**2.2 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.

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2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

**2.3 BALLASTS AND DRIVERS**

- A. Manufacturers:
  1. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
- B. Ballasts/Drivers - General Requirements:
  1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- C. Dimmable LED Drivers:
  1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.
  2. Control Compatibility: Fully compatible with the dimming controls to be installed.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

**3.3 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Install lamps in each luminaire.

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**3.4 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products.  
Repair or replace excessively noisy ballasts as determined by Architect.

**3.5 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

**3.6 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

**3.7 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

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**SECTION 270529  
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

**1.2 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 270533.13 - Conduit for Communications Systems: Additional support and attachment requirements for conduits.
- C. Section 011813 - Sustainable Design Requirements

**1.3 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- F. MFMA-4 - Metal Framing Standards Publication 2004.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.



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4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
  5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.

**1.6 QUALITY ASSURANCE**

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.1 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. TIA-569.
    - b. NFPA 70.
    - c. Requirements of authorities having jurisdiction.
  2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
  3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
  4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.

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1. Comply with TIA-569.
2. Cable Supports Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
3. J-Hooks: Noncontinuous cabling support with removable top retainer clip.
  - a. Material: Use galvanized steel, factory-painted steel, or stainless steel.
  - b. Provide support surfaces with smooth, beveled edges and radius not less than minimum allowable bend radius of cables supported.
  - c. Provide multitiered J-hooks where required to support multiple cabling systems.
- D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- E. Metal Channel/Strut Framing Systems:
  1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  2. Comply with MFMA-4.
- F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- G. Anchors and Fasteners:
  1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Provide required seismic controls.
- H. Equipment Support and Attachment:
  1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
  2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

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3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
  - I. Secure fasteners in accordance with manufacturer's recommended torque settings.
  - J. Remove temporary supports.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

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**SECTION 270533.13  
CONDUIT FOR COMMUNICATIONS SYSTEMS**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel intermediate metal conduit (IMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Galvanized steel electrical metallic tubing (EMT).
- E. High-density polyethylene (HDPE) conduit.

**1.2 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 011813 - Sustainability Design Requirements

**1.3 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.
- D. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD) 2016.
- E. ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct 2017.
- F. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- G. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- H. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition 2020.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- J. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- K. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- L. NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit 2021.
- M. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises 2020e.
- O. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- P. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.

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- Q. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- R. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- S. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit Current Edition, Including All Revisions.
- T. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- U. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.
- V. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
  - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

**1.6 QUALITY ASSURANCE**

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

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**PART 2 PRODUCTS**

**2.1 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or high-density polyethylene (HDPE) conduit.
  - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or high-density polyethylene (HDPE) conduit.
  - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or high-density polyethylene (HDPE) conduit.
  - 4. Where high-density polyethylene (HDPE) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from underground.
  - 5. Where HDPE conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows or concrete-encased PVC elbows for bends.
- D. Embedded Within Concrete:
  - 1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT). Embed within structural slabs only where approved by Structural Engineer.

**2.2 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70 and TIA-569.
- B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

**2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  - 2. Material: Use steel or malleable iron.

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3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
  - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

**2.4 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
  4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

**2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Manufacturers:
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

**2.6 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.

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4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
  - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

**2.7 HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT**

- A. Description: NFPA 70, Type HDPE high-density polyethylene solid-wall conduit complying with ASTM F2160 and NEMA TC 7; list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.
- B. Joining Methods: Approved by HDPE conduit manufacturer.
- C. Mechanical Fittings: Comply with ASTM F2176; list and label as complying with UL 651A.

**2.8 ACCESSORIES**

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- B. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- C. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install galvanized steel intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install galvanized steel electrical metallic tubing (EMT) in accordance with NECA 101.
- F. Conduit Routing:
  1. Unless dimensioned, conduit routing indicated is diagrammatic.
  2. When conduit destination is indicated without specific routing, determine exact routing required.
  3. Conceal conduits unless specifically indicated to be exposed.
  4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Communications rooms.
    - b. Mechanical equipment rooms.
  5. Unless otherwise approved, do not route exposed conduits:
    - a. Across floors.
    - b. Across roofs.
    - c. Across top of parapet walls.



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- d. Across building exterior surfaces.
- 6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
- 7. Arrange conduit to maintain adequate headroom, clearances, and access.
- 8. Arrange conduit to provide no more than equivalent of two 90-degree bend(s) between pull points.
- 9. Arrange conduit to provide minimum bend radii in accordance with BICSI TDMM.
- 10. Route conduits above water and drain piping where possible.
- 11. Maintain recommended separation from sources of EMI greater than 5 kVA in accordance with BICSI ITSIMM and BICSI TDMM.
- 12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
- 13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
  - a. Heaters.
  - b. Hot water piping.
  - c. Flues.
- G. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
  - 2. Provide required seismic controls.
  - 3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  - 4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  - 5. Use of wire for support of conduits is not permitted.
- H. Connections and Terminations:
  - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  - 3. Use suitable adapters where required to transition from one type of conduit to another.
  - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  - 6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
  - 7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
  - 8. Secure joints and connections to provide mechanical strength and electrical continuity.
- I. Penetrations:

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1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
  4. Conceal bends for conduit risers emerging above ground.
  5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
  7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- J. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
- K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- L. Provide grounding and bonding.

**3.3 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

**3.4 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

**3.5 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

**END OF SECTION**

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**SECTION 271000  
STRUCTURED CABLING**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Communications equipment room fittings.
- D. Communications outlets.
- E. Communications grounding and bonding.
- F. Communications identification.

**1.2 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 262726 - Wiring Devices.
- D. Section 270533.13 - Conduit for Communications Systems.

**1.3 REFERENCE STANDARDS**

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment 2005e.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2020.
- E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2018d, with Addenda (2020).
- F. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- G. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- H. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
- I. UL 444 - Communications Cables Current Edition, Including All Revisions.
- J. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
- K. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.

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2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
  3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Arrange for Communications Service Provider to provide service.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Evidence of qualifications for installer.
- D. Field Test Reports.
- E. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
  1. Record actual locations of outlet boxes and distribution frames.
  2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
  3. Identify distribution frames and equipment rooms by room number on drawings.

**1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
  1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
  2. Supervisors and installers factory certified by manufacturers of products to be installed.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

**1.8 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.1 SYSTEM DESIGN**

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
  1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
  2. Comply with Communications Service Provider requirements.

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3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
  4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
  5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
1. Building Entrance Cable: Copper, 25 -pair.
  2. Provide additional outlets where indicated on drawings.
- C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
1. Locate main distribution frame as indicated on the drawings.
  2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
- D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

## **2.2 PATHWAYS**

- A. Conduit: See section 270533.13.
- B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40 or HDPE (Upon utility company approval).
- C. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

## **2.3 COPPER CABLE AND TERMINATIONS**

- A. Copper Horizontal Cable:
1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
  2. Cable Type - Voice and Data: TIA-568.2 Category 6A ScTP (screened twisted pair) or F/UTP (foiled unshielded twisted pair); 23 AWG.
  3. Cable Capacity: 4-pair.
  4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
  5. Cable Jacket Color - Voice and Data Cable: Blue.
- B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
  2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
- D. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
  2. Patch Cords for Patch Panels:

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- a. Quantity: One for each pair of patch panel ports. 2', 3' or 5' patch cables to cross connect from patch panels to switch ports
- b. Length: 5ft or as specified by the City.

**2.4 COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

- A. Copper Cross-Connection Equipment:
  - 1. Connector Blocks for Category 3 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
  - 2. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
  - 3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
    - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
    - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
    - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    - d. Provide incoming cable strain relief and routing guides on back of panel.
- B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
  - 1. Size: As indicated on drawings.
  - 2. Do not paint over UL label.
- C. Equipment Frames, Racks and Cabinets:
  - 1. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
  - 2. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
- D. Cable Management:
  - 1. Product(s):
    - a. CommScope Cable Runway: [www.commscope.com/#sle](http://www.commscope.com/#sle).
    - b. CommScope Horizontal/Vertical Cable Managers; \_\_\_\_\_  
: [www.commscope.com/#sle](http://www.commscope.com/#sle).

**2.5 COMMUNICATIONS OUTLETS**

- A. Outlet Boxes: Comply with Section 260533.16.
  - 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
- B. Wall Plates:
  - 1. Comply with system design standards and UL 514C.
  - 2. Accepts modular jacks/inserts.
  - 3. Capacity:
    - a. Data or Combination Voice/Data Outlets: 4.
  - 4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 262726.

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**2.6 GROUNDING AND BONDING COMPONENTS**

- A. Comply with TIA-607.

**2.7 IDENTIFICATION PRODUCTS**

- A. Comply with TIA-606.

**2.8 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test cables according to TIA-568 (SET).

**PART 3 EXECUTION**

**3.1 INSTALLATION - GENERAL**

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- E. Comply with City of Berkeley Patch Panel Numbering convention.

**3.2 INSTALLATION OF PATHWAYS**

- A. Install pathways with the following minimum clearances:
  - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
  - 2. 12 inches (300 mm) from power conduits and cables and panelboards.
  - 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
  - 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Outlet Boxes:
  - 1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
    - a. Mounting Heights: Unless otherwise indicated, as follows:
    - b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
    - c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
    - d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
    - e. Locate outlet boxes so that wall plate does not span different building finishes.
    - f. Locate outlet boxes so that wall plate does not cross masonry joints.

**3.3 INSTALLATION OF EQUIPMENT AND CABLING**

- A. Cabling:
  - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

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2. Do not over-cinch or crush cables.
  3. Do not exceed manufacturer's recommended cable pull tension.
  4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches (3000 mm).
- C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
  2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
  3. Use T568B wiring configuration.
- D. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
- E. Identification:
1. Use wire and cable markers to identify cables at each end.
  2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
  3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

**3.4 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
- D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

**END OF SECTION**



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**SECTION 31 10 00**

**SITE CLEARING**

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**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes:

1. Removal of existing trees and vegetation
2. Clearing vegetation, debris, trash and other materials within limits indicated
3. Grubbing of vegetation within limits indicated
4. Stripping of topsoil within limits indicated
5. Removing above-grade site improvements within limits indicated
6. Disconnecting, capping or sealing, and abandoning site utilities in place
7. Disconnecting, capping or sealing, and removing site utilities
8. Disposing of objectionable material

B. Related Sections:

1. Section 31 20 00, Earth Moving
2. Section 31 21 00, Utility Trenching and Backfill
3. Section 01 18 13 Sustainable Design Requirements

C. Related Documents:

1. City of Berkeley Standard Details
2. Geotechnical Report: Geotechnical Investigation Report Willard Park Clubhouse and Restroom Building 2730 Hillegass Avenue Berkeley, California by BKS Associates dated April 13, 2022.
3. ANSI A300: Industry Standards for Tree Care Practices
4. Applicable Publications
  - a. "Trees and Building Sites," official publication of the International Society of Arboriculture.

- b. "Arboriculture," the care of trees and shrubs by Dr. Richard Harris.

## 1.2 DEFINITIONS

- A. ANSI: American National Standards Institute
- B. CAL-OSHA: California Occupational Safety and Health Administration
- C. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

## 1.3 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

## 1.4 QUALITY ASSURANCE

- A. Do not remove or prune trees without first securing a permit from the appropriate agency.
- B. Prune to the standards of the International Society of Arborists and to ANSI A300.

## 1.5 PROJECT CONDITIONS

- A. Except for materials indicated to be stockpiled or to remain the Owner's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store where indicated on plans or where designated by the Owner. Avoid damaging materials designated for salvage.
- C. Unidentified Materials;
  - 1. If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner's Representative.
  - 2. If necessary, the Owner's Representative will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

## **PART 2 - PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to engineered fill defined in Section 31 20 00, Earth Moving.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain during construction.

### **3.2 TREE REMOVAL**

- A. Remove trees designated for removal prior to the construction of new improvements in the vicinity:
  - 1. When demolishing trees indicated to be removed within areas for new pavement or hardscape, remove tree, stump to a depth of two (2) feet below finish grade, and all roots located in the top twelve (12) inches of soil. Remove wood chips created from grinding process down to remaining stump then refill void and re-compact to 80% relative compaction. Use import soil as indicated in specifications for this purpose. Import soil and compaction in future paved areas shall be in accordance with Geotechnical recommendations.
  - 2. When demolishing trees indicated to be removed within new landscaped areas, removal shall be done in one of the following ways:
    - a. For trees located in accessible areas, remove tree and grind stump to four (4) inches below finish grade. Backfill the void and re-compact to 80% relative compaction. Use import soil as indicated in specifications for this purpose. Do not remove existing roots.
    - b. For trees located in inaccessible areas, cut stump flush with finish grade, and cover with 3 inches of bark mulch. Do not grind the stump and do not remove existing roots.
- B. Perform tree removal work in a safe and proper manner, adhering to CAL-OSHA tree work protection standards and ANSI A300 Standards.
- C. All trees to be demolished shall be removed in such a way as to not damage branches, trunks, or root systems of adjacent trees.

### **3.3 RESTORATION**

- A. Restore damaged improvements to their original condition, as acceptable to the Owner's Representative.

- B. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, as directed by the Owner's Representative.
  - 1. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
  - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Owner's Representative.

### 3.4 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.
- B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner's Representative or others unless authorized in writing by the Owner's representative, and then only after arranging to provide temporary utility services according to requirements indicated.
- D. Coordinate utility interruptions with utility company affected.
- E. Do not proceed with utility interruptions without the permission of the Owner's Representative and utility company affected. Notify Owner's Representative and utility company affected two working days prior to utility interruptions.
- F. Excavate and remove underground utilities that are indicated to be removed.
- G. Fill abandoned piping with cement slurry.
- H. Securely close ends of abandoned piping with tight fitting plug or cement slurry minimum 6 inches thick.

### 3.5 CLEAR AND GRUBBING

- A. Areas to be graded shall be cleared of existing vegetation, rubbish, existing structures, and debris.
- B. Remove obstructions, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
- C. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
- D. Use only hand methods for grubbing within drip line of remaining trees.

### 3.6 SITE STRIPPING

- A. Strippings and spoils shall be disposed at an off-site location, per geotechnical recommendations.

- B. Remove vegetation before stripping soil.
- C. Surface soils that contain organic matter should be stripped. In general, the depth of required stripping will be relatively shallow (i.e. less than 2 inches); deeper stripping and grubbing may be required to remove isolated concentrations of organic matter or roots.
- D. Remove trash, debris, weeds, roots, and other waste materials.
- E. Stockpile soil materials designated to remain on site at a location approved by the Owner's Representative at a location away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
- F. Do not stockpile soil within drip line of remaining trees.

### 3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

### 3.8 BACKFILL

- A. Place and compact material in excavations and depressions remaining after site clearing in accordance with Section 31 20 00, Earth Moving.

### 3.9 DISPOSAL

- A. Remove surplus soil material, unsuitable soil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner's property.

**END OF SECTION**

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**SECTION 31 20 00**

**EARTH MOVING**

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**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes:

1. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for roadways, driveways, parking areas, building pads, walks, paths, or trails and any other site improvements called for on the Plans.

B. Section Excludes:

1. Earthwork related to underground utility installation shall be performed in accordance with Sections 31 21 00, Utility Trenching and Backfill.

C. Related Sections:

1. Section 31 10 00, Site Clearing
2. Section 31 21 00, Utility Trenching and Backfill
3. Section 01 18 13 Sustainable Design Requirements

D. Related Documents:

1. City of Berkeley Standard Details
2. Geotechnical Report: Geotechnical Investigation Report Willard Park Clubhouse and Restroom Building 2730 Hillegass Avenue Berkeley, California by BKS Associates dated April 13, 2022.
3. ASTM
  - a. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
  - b. D1586, Method for Penetration Tests and Split-Barrel Sampling of Soils
  - c. D2487, Classification of Soils for Engineering Purposes
  - d. D3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

- e. D4318. Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
  - f. E329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
  - g. E548, Guide for General Criteria Used for Evaluating Laboratory Competence
- 4. California Building Code, California Code of Regulations, Title 24, Part 2, Chapter 18, Soils and Foundations, and Chapter 33, Safeguards During Construction
  - 5. Caltrans Standard Specifications, 2022
    - a. Section 17, General
    - b. Section 19, Earthwork
  - 6. CAL/OSHA, Title 8.

## 1.2 DEFINITIONS

- A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.
- B. Excavation: Removal of material encountered above subgrade elevations.
  - 1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the Geotechnical Engineer.
  - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the Geotechnical Engineer. Unauthorized excavation shall be without additional compensation.
- C. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.
- D. Structural Backfill: Soil materials approved by the Geotechnical Engineer and used to fill excavations resulting from removal of existing below grade facilities, including trees.
- E. Structural Fill: Soil materials approved by the Geotechnical Engineer and used to raise existing grades.
- F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material  $\frac{3}{4}$  cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D1586, exceeds a standard penetration resistance of 100 blows/2 inches.

- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below grade.
- H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- I. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.
- J. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project. The Geotechnical Engineer will determine if a soil material is unsuitable.
- K. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure ASTM D1557.
- L. Utilities: onsite underground pipes, conduits, ducts and cables.

### 1.3 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Samples:
  - 1. If required by the Geotechnical Engineer, provide 20 pound samples, sealed in airtight containers, tagged with source locations and suppliers of each proposed soil material from on-site or borrow sources, 72 hours prior to use. Do not import materials to the Project without written approval of the Geotechnical Engineer.
  - 2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Engineer.
- C. Material Test Reports: Provide, from a qualified testing agency, the following test results showing compliance with the project requirements:
- D. Classification according to ASTM D2487 of each onsite or borrow soil material proposed for fill and backfill.
  - 1. Laboratory compaction curve in conformance with ASTM D1557 for each onsite or borrow soil material proposed for fill and backfill.

### 1.4 QUALITY ASSURANCE

- A. Provide an independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.



- B. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Engineer.
- C. Conform all work in accordance with Caltrans Standard Specification Section 17, General and Section 19, Earthwork.
- D. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D1557.
- E. Perform excavation, filling, compaction and related earthwork under the observation of the Geotechnical Engineer. Materials placed without approval of the Geotechnical Engineer will be presumed to be defective and, at the discretion of the Geotechnical Engineer, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Engineer at least 24 hours prior to commencement of earthwork and at least 48 hours prior to testing.
- F. The Geotechnical Engineer will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the Geotechnical Engineer, does not meet the requirements of these Technical Specifications and the Geotechnical Report.
- G. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications and the Geotechnical Report. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces and shall replace portions that in the opinion of the Geotechnical Engineer have been displaced or are otherwise unsatisfactory due to the Contractor's operations.
- H. Finish subgrade tolerance at completion of grading:
  - 1. Building and paved areas:  $\pm 0.05$  feet
  - 2. Other areas:  $\pm 0.10$  feet

#### 1.5 PROJECT CONDITIONS

- A. Promptly notify the Owner's Representative of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner's Representative verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless the Contractor has notified the Owner's Representative in writing of differing conditions prior to the Contractor starting work on affected items.
- B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

- C. Prevent erosion of freshly-graded areas during construction and until such time as permanent drainage and erosion control measures have been installed in accordance with the project Erosion Control Plans and the City of Berkeley Pollution Prevention Plan.
- D. Temporarily stock-pile fill material in an orderly and safe manner and in a location approved by the Owner's Representative.
- E. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

## **PART 2 - PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. General: On-site soils are considered suitable for use as fill provided the materials are placed in accordance with Geotechnical Recommendations. Highly expansive soils shall not be used as select structural fill, or used as backfill for trenches located within hardscape areas.
- B. Imported fill soils, if required, should be predominantly granular in nature, and should be free of organics, debris, or rocks over 3 inches in size, and shall be approved by the Geotechnical Engineer before importing to the site. Imported non-expansive soils shall have a Plasticity Index less than 15 as determined by ASTM D4318, an R-value of at least 20, and fines content between 15 and 65 percent. Import fill shall be considered non-hazardous per Department of Toxic Substances Control guidelines (DTSC, 2022) and non-corrosive per Caltrans Corrosion Guidelines (Caltrans, 2022).

### **2.2 SOIL STERILANT**

- A. Commercial chemical for weed control, registered by EPA. Provide granular, liquid or wet-able powder form.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- B. Perform work in accordance with Caltrans Standard Specification Section 19, Earthwork.
- C. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.
- D. The use of explosives will not be permitted.
- E. Grading and earthwork operations shall be observed and tested by a representative of the Geotechnical Engineer for conformance with the project plans/specifications and the geotechnical recommendations. This work includes site preparation, selection

of satisfactory materials, and placement and compaction of the subgrades and fills. Sufficient notification prior to commencement of earthwork is essential to make certain that the work will be properly observed.

### 3.2 CONTROL OF WATER AND DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.
- B. Dewater during backfilling operation so that groundwater is maintained a least 1 foot below level of compaction effort.
- C. Obtain the Geotechnical Engineer's approval for proposed control of water and dewatering methods.
- D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.
- E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
- F. Maintain dewatering system in place until dewatering is no longer required.

### 3.3 WET WEATHER CONDITIONS

- A. Do not prepare subgrade, place or compact soil materials if subgrade or materials are above optimum moisture content.
- B. If the Geotechnical Engineer allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Engineer.

### 3.4 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Geotechnical Engineer, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.

- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### 3.5 TOPSOIL STRIPPING

- A. Remove topsoil in accordance with Section 31 10 00, Site Clearing.

### 3.6 EXCAVATION

- A. Excavate earth and rock to lines and grades shown on plans and to the neat dimensions indicated on the plans, required herein or as required to satisfactorily compact backfill.
- B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.
- C. Excavation through buried concrete and other unknown obstructions will require specialized techniques for demolition and removal.
- D. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.
- E. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

### 3.7 GRADING

- A. Uniformly grade the Project to the elevations shown on plans
- B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.
- C. Round tops and bottoms of slopes as indicated or to blend with existing contours.

### 3.8 SUBGRADE PREPARATION

- A. Subgrade Preparation: Prior to backfilling depressions created by the removal of old foundations and utility lines, scarify the bottom of the excavation to an approximate depth of 8 inches and uniformly moisture condition the scarified surfaces to a moisture content that is at least 2 percent over optimum. Compact the scarified surfaces to a minimum of 90 percent relative compaction at above optimum moisture content.
- B. Over-excavate any remaining soft (pumping) areas down to firm soil and backfill the area.
- C. Subgrade shall be maintained in a moist, but not wet, condition by periodically sprinkling water prior to the placement of additional fill or installation of roads. Subgrade that has been permitted to dry out and loosen or develop desiccation cracking should be scarified, moisture conditioned, and re-compacted as recommended above.

- D. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.
- E. Prepare subgrades under the structural section of paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.
- F. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.
- G. Obtain the Geotechnical Engineer's approval of subgrades prior to placing pavement structural section.

### 3.9 LOT FINISH GRADING

- A. Blade finish lots to lines and grades indicated.

### 3.10 FILL PLACEMENT AND COMPACTION

- A. Place fill in uniformly moisture conditioned and compacted lifts not exceeding 8 inches in loose thickness. Each lift should be thoroughly moisture conditioned and compacted to 90 percent before successive fill layers are placed.
- B. In order to achieve satisfactory compaction in the subgrade and fill soils, it may be necessary to adjust the soil moisture content at the time of soil compaction per geotechnical recommendations. This may require that water be added and thoroughly mixed into any soils which are too dry or that scarification and aeration be performed in any soils which are too wet.
- C. Obtain the Geotechnical Engineer's approval of surface to receive structural fill prior to placement of structural fill material.
- D. Place structural fill on prepared subgrade.
- E. Do not drop fill on structures. Do not backfill around, against or upon concrete or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.
- F. Do not compact by ponding, flooding or jetting.
- G. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the Geotechnical Engineer.
- H. Compaction requirements (unless specified otherwise by the Geotechnical Engineer):
  - 1. Compact structural fills less than 5 feet thick to 90 percent compaction.
  - 2. Compact structural fill 5 feet thick or greater to 95 percent compaction.
  - 3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction. Extend compaction 5 feet beyond pavement edges unless specified otherwise by the Geotechnical Engineer.

4. Compact the upper 6 inches of subgrade soils under walks, structures and areas to receive structural fill to 90 percent compaction.

### 3.11 SOIL STERILIZATION

- A. Apply soil sterilant to areas indicated, such as beneath asphalt concrete pavement, brick pavement, concrete pavement and at grade concrete slabs, including sidewalks, curbs and gutters. Also where indicated apply soil sterilant below expansion and control joints and at areas where pipes, ducts or other features penetrate slabs.
- B. Apply soil sterilant uniformly and at the rates recommended by the manufacturer.
- C. Apply soil sterilant to prepared subgrade, or after installation of aggregate base as recommended by the manufacturer.

### 3.12 DISPOSAL

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

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**SECTION 32 21 00**

**UTILITY TRENCHING AND BACKFILL**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Excavation, bedding, and backfill for underground storm drain, sanitary sewer, and water piping, underground HVAC piping, electrical conduit, telephone conduit, gas piping, cable TV conduit, etc., and associated structures.
- B. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
  - 1. Select Backfill Material
  - 2. Aggregate Base
  - 3. Detectable Tape
  - 4. Trench Excavation
  - 5. Pipe Bedding
  - 6. Trench Backfill
  - 7. Trench Surfacing
- C. This section excludes drainage fill material and placement around subdrains.
- D. Related Sections:
  - 1. Section 31 10 00 – Site Clearing
  - 2. Section 31 20 00 – Earthwork Moving
  - 3. Section 33 10 00 – Water System
  - 4. Section 33 30 00 – Sanitary Sewer System
  - 5. Section 33 41 00 – Storm Utility Drainage Piping
  - 6. Section 01 18 13 Sustainable Design Requirements
- E. Related Documents:

1. Geotechnical Report: Geotechnical Investigation Report Willard Park Clubhouse and Restroom Building 2730 Hillegass Avenue Berkeley, California by BKS Associates dated April 13, 2022.
2. City of Berkeley Standard Details
3. City of Berkeley Resolution No. 62,693-N.S.: Adopting an Environmentally Preferable Purchasing Policy (EPP)

## 1.2 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Test Reports: Submit the following report for import material directly to the Owner from the Contractor's testing services:
  1. Compaction test reports for aggregate base.
- C. Samples:
  1. If required by the Geotechnical Engineer, provide 20-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material. Do not import materials to Project without written approval of the Geotechnical Engineer and the Owner.
  2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Engineer and the Owner.

## 1.3 QUALITY ASSURANCE

- A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Engineer.
- B. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19, Earthwork.
- C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- D. The Geotechnical Engineer will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. Correct the trench backfill that, in the opinion of the Geotechnical Engineer, does not meet the requirements of these Technical Specifications and the Geotechnical Report.
- E. Soil Testing:
  1. Contractor to engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.



2. Test results will be submitted to the Owner.

#### 1.4 PROJECT CONDITIONS

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless Contractor has notified the Owner in writing of differing conditions prior to contractor starting work on affected items.
- B. Barricade open excavations and post with warning lights.
  1. Operate warning lights and barricades as required.
  2. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.
  3. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.
- D. Provide dust and noise control in conformance with Section 01 10 00 Supplemental General Requirements.
- E. Environmental Requirements:
  1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
  2. Protect existing streams, ditches and storm drain inlets during work on this project.
- F. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
- G. Transport all excess soils materials by legally approved methods to disposal areas.
  1. Coordinate with the Engineer.
  2. Any additional fill requirements shall be the responsibility of the Contractor.

#### 1.5 EXISTING UTILITIES

- A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.

1. Locating of existing underground utilities shall include but not be limited to pot-holing prior to the start of construction.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Owner and/or utility agency immediately for directions.
  1. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation.
  2. Repair damaged utilities to the satisfaction of the agency with jurisdiction.
- C. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner and then only after acceptable temporary utility services have been provided.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Import materials will be subject to approval of the Geotechnical Engineer.
- B. For approval of imported fill material, notify the Owner at least 7 days in advance of intention to import material.

### **2.2 PIPE BEDDING AND INITIAL BACKFILL**

- A. ASTM D2321, Class IA, IB or II.
  1. Clean and free of clay, silt or organic matter.
- B. Permeable Material: In accordance with Section 68-2.02F of Caltrans Standard Specifications, Class 1, Type A or Class 2.
- C. Class 2 Aggregate Base: In accordance with Section 26 of Caltrans Standard Specifications,  $\frac{3}{4}$  inch maximum.
- D. Sand: In accordance with Section 19-3.02F of Caltrans Standard Specifications.

### **2.3 SELECT BACKFILL**

- A. Select backfill material shall be gravel, free of clay or organic matter and shall conform to the following gradation:

Sieve Size	Percentage Passing
1 inch	100
¾ inch	90 – 100
No. 4	35 – 60
No. 200	2 - 9

## 2.4 WARNING TAPE

- A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

### 2. Warning Tape Color Codes

- a. Red: Electric
  - b. Yellow: Gas, Oil; Dangerous Materials
  - c. Orange: Telephone and Other Communications
  - d. Blue: Water Systems
  - e. Green: Sewer Systems
  - f. White: Steam Systems
  - g. Gray: Compressed Air
- B. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
- C. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

## 2.5 DETECTION WIRE FOR NON-METALLIC PIPING

- A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

## 2.6 SUBSEQUENT BACKFILL

- A. Conform to on-site or imported structural backfill in Section 31 20 00, Earth Moving.

## 2.7 CONTROLLED DENSITY FILL (CDF) (IN TRENCHES)

- A. Provide non-structural CDF, from bottom of trench to finish subgrade of subbase or base material, that can be excavated by hand and produce unconfined compressive 28-day strengths from 50-psi to a maximum of 150-psi. Provide aggregate no larger than 3/8 inch top size. The 3/8 inch aggregate shall not comprise more than 30% of the total aggregate content.
- B. Cement: Conform to the standards as set forth in ASTM C150, Type II Cement.
- C. Fly Ash: Conform to the standards as set forth in ASTM C618, for Class F pozzolan. Do not inhibit the entrainment of air with the fly ash.
- D. Air Entraining Agent: Conform to the standards as set forth in ASTM C260.
- E. Aggregates need not meet the standards as set forth in ASTM C33. Any aggregate, producing performances characteristics described herein will be accepted for consideration. The amount of material passing a #200 sieve shall not exceed 12% and no plastic fines shall be present.
- F. Provide CDF that is a mixture of cement, Class F pozzolan, aggregate, air entraining agent and water. CDF shall be batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.
- G. The Contractor shall determine the actual mix proportions of the controlled density fill to meet job site conditions, minimum and maximum strengths, and unit weight. Entrained air content shall be a minimum of 4.0%. The actual entrained air content shall be established for each job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.
- H. Mix design shall meet the Geotechnical Engineer's approval.

## 2.8 CONCRETE STRUCTURE BEDDING AND BACKFILL

- A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill, or other material approved by the Geotechnical Engineer.
- B. Poured-in-Place Structures:
  - 1. Bedding: Bedding shall meet the approval of the Geotechnical Engineer. In general, bedding is not required, pour bases against undisturbed native earth in cut areas and against engineered fill compacted to 90% relative compaction in embankment areas.
  - 2. Side Backfill: On-site or imported structural fill meeting the requirements given in Section 31 20 00, Earth Moving.

## 2.9 GEOSYNTHETICS

- A. Filter Fabric:
  - 1. Filter Fabric: Section 96-1.02 of Caltrans Standard Specifications.

2. Mirafi 140N, Mirafi Inc., or approved equal.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Comply with the recommendations of the Geotechnical Engineer.
- B. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.
- C. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
- D. Unless otherwise indicated in the Plans, all excavation for pipelines shall be open cut.
- E. Prior to commencement of work, become thoroughly familiar with site conditions.
- F. In the event discrepancies are found, immediately notify the Owner in writing, indicating the nature and extent of differing conditions.
- G. Backfill excavations as promptly as work permits.
- H. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Owner.
- I. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
- J. In excavations, use satisfactory excavated or borrow material.
- K. Under grassed areas, use satisfactory excavated or borrow material.

#### **3.2 SITE PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.

#### **3.3 EXISTING UTILITIES**

- A. Identify the location of existing utilities.
  1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Plans, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.

2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
  3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Owner to clear the utility.
- B. Protect all existing utilities to remain in operation.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
  2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
  3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
  4. Report damage of utility line or subsurface structures immediately to the Owner.
- E. Backfill trenches resulting from utility removal in lifts of 8 inches maximum.

### 3.4 TRENCH EXCAVATION

#### A. General

1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.

#### B. Existing Paving and Concrete:

1. Existing pavement over trench shall be sawcut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut along the limits of excavations.

2. Existing concrete over the trench shall be sawcut to a full depth in straight lines, at a minimum distance of 12 inches beyond the edge of the trench, either parallel to the curb or at right angles to the alignment of the sidewalk.
3. Boards or other suitable material shall be placed under equipment outrigging to prevent damage to paved surfaces.

C. Trench Width:

1. The maximum allowable trench widths at the top of the all pipe materials outside diameter of barrel pipe plus 18 inches. shall be as follows:
  - a. The maximum trench width shall be inclusive of all shoring.
  - b. If the maximum trench width is exceeded, the State's representative may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.
2. For pipes 3-inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.

D. Excavation Width at spring line of Pipe:

1. Up to a nominal pipe diameter of 24 inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the Geotechnical Engineer.
2. Nominal pipe diameter of 30 inches through 36 inches: Minimum of the outside pipe diameter plus 2 feet, or as otherwise allowed or required by the Geotechnical Engineer.
3. Nominal pipe diameter of 42 inches through 60 inches: Minimum of the outside pipe diameter plus 3 feet, or as otherwise allowed or required by the Geotechnical Engineer.

E. Open Trench:

1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.
3. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.
4. Excavation Depth for Bedding: Minimum of 6 inches below bottom of pipe or as otherwise allowed or required by the Geotechnical Engineer, except that bedding is not required for nominal pipe diameters of 2 inches or less.

5. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.
6. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.
7. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

F. Excavated Material:

1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

### 3.5 CONTROL OF WATER AND DEWATERING

- A. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage to the satisfaction of the Geotechnical Engineer and the Owner until backfilling is completed.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Geotechnical Engineer's approval for proposed control of water and dewatering methods.
- D. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.
- E. Maintain dewatering system in place until dewatering is no longer required.

### 3.6 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to



the Geotechnical Engineer, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the Owner.

- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

### 3.7 PIPE BEDDING

- A. Obtain approval of bedding material from the Geotechnical Engineer.
- B. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8 inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Engineer. Jetting or ponding of bedding material will not be permitted.
- C. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The State's inspector will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
- D. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing select backfill material. Sufficient select backfill material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

### 3.8 BACKFILLING

- A. Initial Backfill:
  - 1. Obtain approval of backfill material from Geotechnical Engineer.
  - 2. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12 inches above the top of the pipe in layers not exceeding 8 inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Engineer. Jetting or ponding of initial backfill material will not be permitted.

- B. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.
- C. Installation of Tracer Wire:
1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
  2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.
  3. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance. Extend the wire up the outside of the valve box/riser and cut a hole that is 8 inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, terminate the 12-inch wire lead inside the enclosure.
  4. Splice wire with a splicing device consisting of an electro-tin-plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.
- D. Installation of Warning Tape
1. Install tape approximately 1 foot above and along the centerline of the pipe.
  2. Where tape is not continuous lap tape ends a minimum of 2 feet.
- E. Subsequent Backfill:
1. Above the level of initial backfill, the trench shall be backfilled with non-expansive native material from trench excavation or with imported select backfill material (Contractor's option). Subsequent backfill shall be free of vegetable matter, stones or lumps exceeding 3 inches in greatest dimension, and other unsatisfactory material.
  2. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8 inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction, except that the upper 36 inches in areas subject to vehicular traffic shall be compacted to at least 95% relative compaction, unless specified otherwise on the Plans or by the Geotechnical Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Engineer. Jetting or ponding of subsequent backfill material will not be permitted.
- F. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive pipe displacement or damage the pipe. Jetting of trench backfill is not permitted.
- G. Utility backfill shall be inspected and tested by the Geotechnical Engineer during placement. Cooperate with the Geotechnical Engineer and provide working space for

such tests in operations. Backfill not compacted in accordance with these specifications shall be re-compacted or removed as necessary and replaced to meet the specified requirements, to the satisfaction of the Geotechnical Engineer and the Owner prior to proceeding with the Project.

- H. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

### 3.9 CLEANUP

- A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.

**END OF SECTION**

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**SECTION 32 01 91**

**TREE PROTECTION**

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**PART 1 - GENERAL**

1.01 SUMMARY

- A. The scope of work includes all labor, materials, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with protection of existing trees and other plants as shown on the drawings and as specified herein.
  - 1. Provide tree protection fencing.
  - 2. Provide protection of root zones and above ground tree and plants
  - 3. Provide pruning of existing trees and plants.
  - 4. Coordinate with the requirements of Section Planting Soil for modifications to the soil within the root zone of existing trees and plants.
  - 5. Provide maintenance of existing trees and plants including irrigation during the construction period as recommended by the arborist report.
  - 6. Provide maintenance of existing trees and plants including irrigation during the post construction plant maintenance period.
  - 7. Remove tree protection fencing and other protection from around and under trees and plants.
  - 8. Clean up and disposal of all excess and surplus material.

1.02 RELATED DOCUMENTS AND REFERENCES

- A. Drawings and general provisions of contract including general and supplementary conditions and Division I specifications apply to work of this section.
- B. Planting Irrigation: Section 32 84 00
- C. Planting: Section 32 90 00
  - 1. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement prevails.
- D. ANSI A 300 (Part 5) – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current editions.
- E. Pruning practices must conform with recommendations “Structural Pruning: A Guide For The Green Industry”; Published by Urban Tree Foundation, Visalia, California; most current edition.
- F. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign Il, most current edition.

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1.03 PERMITS AND REGULATIONS

- A. The Contractor must obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The Contractor must comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor must promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.
- B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract must apply, unless otherwise expressly set forth.
- C. In case of conflict among any referenced standards or codes or between any referenced standards and codes and the specifications, the more restrictive standard apply or Owner's Representative will determine which will govern.

1.04 PROTECTION OF WORK, PROPERTY AND PERSON

- A. The Contractor must protect the work, adjacent property, and the public, and will be responsible for any damages or injury due to his/her actions.

1.05 CHANGES IN THE WORK

- A. The Owner's Representative may order changes in the work, and the contract sum should be adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.

1.06 CORRECTION OF WORK

- A. The Contractor must re-execute any work that fails to conform to the requirements of the contract and must remedy defects due to faulty materials or workmanship upon written notice from the Owner's Representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands.

1.07 DEFINITIONS

- A. All terms in this specification to be interpreted as defined in the "Glossary of Arboricultural Terms" or as modified below.
- B. Owner's Representative: The person appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner's Representative may appoint other persons to review and approve any aspects of the work.
- C. Reasonable and reasonably: When used in this specification is intended to mean that the conditions cited will not affect the establishment or long term stability, health or growth of the plant. This specification recognizes that plants are not free of defects, and that plant conditions change with time. This specification also recognizes that some decisions cannot be totally based on measured findings and that profession judgment is required. In cases of differing opinion, the Owner's Representative expert will determine when conditions within the plant are judged as reasonable.

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- D. Shrub: Woody plants with mature height approximately less than 25 feet.
- E. Tree Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle centered on the trunk of each tree with a radius equal to the crown dripline unless otherwise indicated by the owner's representative or on the Tree Preservation Plan.
- F. Tree: Single and multi-stemmed plants, including palms with anticipated mature height approximately greater than 25 feet or any plant identified on the plans as a tree.

**1.08 SUBMITTALS**

- A. **PRODUCT DATA:** Submit manufacturer product data and literature describing all products required by this section to the Owner's Representative for approval. Provide submittal four weeks before the start of any work at the site.
- B. **QUALIFICATIONS SUBMITTAL:** For each applicable person expected to work on the project, provide copies of the qualifications and experience of the Project Arborist, proof of either the Registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Board Certified Arborist and any required Herbicide/Pesticide license to the Owner's Representative, for review prior to the start of work.

**1.09 OBSERVATION OF THE WORK**

- A. The Owner's Representative may inspect the work at any time.

**1.10 PRE-CONSTRUCTION CONFERENCE**

- A. Schedule a pre-construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.
  - 1. The following Contractors must attend the preconstruction conference:
    - a. General Contractor.
    - b. Consulting Arborist.
    - c. Subcontractor assigned to install Tree and Plant Protection measures.
    - d. Earthwork Contractor.
    - e. All site utility Contractors that may be required to dig or trench into the soil.
    - f. Landscape subcontractor.
    - g. Prior to this meeting, mark all trees and plants to remain and or be removed as described in this specification for review and approval by the Owner's Representative.

**1.11 QUALITY ASSURANCE**

- A. Contractor qualifications:
  - 1. All pruning, branch tie back, tree removal, root pruning, and fertilizing required by this section must be performed by or under the direct supervision of an ISA Certified Arborist. Submit aforementioned individual's qualifications for approval by the Owner's Representative.
  - 2. All applications of pesticide or herbicide must be performed by a person maintaining a current state license to apply chemical pesticides valid in the jurisdiction of the project.

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Submit copies of all required state licensing certificates including applicable chemical applicator licenses.

**PART 2 - PRODUCTS**

**2.01 TREE PROTECTION FENCING:**

- A. **PLASTIC MESH FENCE:** Heavy - duty orange plastic mesh fencing fabric 48 inches wide. Fencing to be attached to metal "U" or "T" post driven into the ground of sufficient depth to hold the fabric solidly in place with out sagging. The fabric is to be attached to the post using attachment ties of sufficient number and strength to hold up the fabric without sagging. The Owner's Representative may request, at any time, additional post, deeper post depths and or additional fabric attachments if the fabric begins to sag, lean or otherwise not present a sufficient barrier to access.
- B. **CHAIN LINK FENCE:** 6 foot tall metal chain link fence set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect in areas of existing paving to remain.

**2.02 TREE PROTECTION SIGN:**

- A. Heavy-duty laminated signs, 8.5 inches x 11 inches, white colored background with black 2 inch high or larger letters block letters. The signs must be attached to the tree protection fence every 50 feet o.c. The tree protection sign to read "Tree Protection Area- Keep Out".

**2.03 ROOT BUFFER ZONE**

- A. The protective buffer consists of a base course of mulch spread over the root area to a minimum of 5-inch depth and covered with a layer of filter fabric, layered by a 4" depth of 3/4-inch quarry gravel to stabilize 3/4-inch plywood on top.

**2.04 TEMPORARY WOOD CHIP MULCH**

- A. Mulch is to be coarse, ground, from tree and woody brush sources. The minimum range of fine particles is to be 3/8 inch or less in size and a maximum size of individual pieces is to be approximately 1 to 1-1/2 inch in diameter and maximum length of approximately 4 to 8 inches..
- B. Wood Chips from an arborist chipping operation with less than 20% by volume green leaves may be used. Chips stockpiled from the tree removal process may be used.

**2.05 FILTER FABRIC**

- A. Filter Fabric must be nonwoven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.
  - 1. Mirafi 135 N as manufactured by Ten Cate Nicolon, Norcross, GA.  
<http://www.tencate.com> or approved equal.
- B. Submit Suppliers' product data that product meets the requirements for approval.

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**PART 3 - EXECUTION**

**3.01 SITE EXAMINATION**

- A. Examine the site, tree, plant and soil conditions. Notify the Owner's Representative in writing of any conditions that may impact the successful Tree and Plant Protections that is the intent of this section.

**3.02 COORDINATION WITH PROJECT WORK**

- A. The Contractor is to coordinate with all other work that may impact the completion of the work.
- B. Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- C. Coordinate the relocation of any irrigation lines currently present on the irrigation plan, heads or the conduits of other utility lines or structures that are in conflict with tree locations. Root balls must not be altered to fit around lines. Notify the Owner's Representative of any conflicts encountered.

**3.03 TREE PROTECTION ZONE: THE TREE PROTECTION ZONE IS DEFINED AS ALL AREAS INDICATED ON THE TREE PRESERVATION PLAN. WHERE NO LIMIT OF THE TREE PROTECTION ZONE IS DEFINED ON THE DRAWINGS, THE LIMIT IS TO BE THE DRIP LINE (OUTER EDGE OF THE BRANCH CROWN) OF EACH TREE.**

**3.04 PREPARATION:**

- A. Prior to the preconstruction meeting, layout the limits of the Tree Protection Zone and then alignments of required Tree Protection Fencing and root pruning. Obtain the Owner's Representative's approval of the limits of the protection zone and the alignment of all fencing and root pruning.
- B. Flag all trees and shrubs to be removed by wrapping orange plastic ribbon around the trunk and obtain the Owner's Representative's approval of all trees and shrubs to be removed prior to the start of tree and shrub removal. After approval, mark all trees and shrubs to be removed with orange paint in a band completely around the base of the tree or shrub 4.5 feet above the ground.
- C. Flag all trees and shrubs to remain with white plastic ribbon tied completely around the trunk of each tree and on a prominent branch for each shrub. Obtain the Owner's Representative's approval of all trees and shrubs to remain prior to the start of tree and shrub removal.
- D. Prior to any construction activity at the site including utility work, grading, storage of materials, or installation of temporary construction facilities, install all tree protection fencing, tree protection signs, root buffers and trunk protection wraps as shown on the drawings.

**3.05 INSTALLATION OF ROOT BUFFER, AND WOOD CHIP MULCH**

- A. Install Root Buffers, and Wood Chip Mulch in areas and depths shown on the plans and details or as directed by the Owner's representative. In general it is the intent of this specification to provide the following levels of protection:
  - 1. Areas where foot traffic or storage of lightweight materials is anticipated to be unavoidable provide 5 inches of Wood Chip Mulch.



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2. Areas where vehicle traffic is anticipated to be unavoidable provide Root Buffer.

- B. The Owner's Representative must approve the appropriate level of protection.
- C. Extreme care must be taken during installation and removal to ensure that the soil is not disturbed or compacted. If machines are used to place or remove protections, they must operate from beyond the TPZ or from a completely installed root buffer.

3.06 PROTECTION:

- A. Protect the Tree Protection Zone at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves and roots of all plants; and contamination of the soil, bark or leaves with construction materials, debris, silt, fuels, oils, and any chemicals substance. Notify the Owner's Representative of any spills, compaction or damage and take corrective action immediately using methods approved by the Owner's Representative.

3.07 GENERAL REQUIREMENTS AND LIMITATIONS FOR OPERATIONS WITHIN THE TREE PROTECTION ZONE:

- A. The Contractor is not to engage in any construction activity within the Tree Protection Zone without the approval of the Owner's Representative including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets and must not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks. Permitted activity, if any, within the Tree Protection Zone maybe indicated on the drawings along with any required remedial activity as listed below.
- B. In the event that construction activity is unavoidable within the Tree Protection Zone, notify the Owner's Representative and submit a detailed written plan of action for approval. The plan must include: a statement detailing the reason for the activity including why other areas are not suited; a description of the proposed activity; the time period for the activity, and a list of remedial actions that will reduce the impact on the Tree Protection Zone from the activity. Remedial actions include but are not limited to the following:
  - 1. In general, demolition and excavation within the drip line of trees and shrubs is to proceed with extreme care either by the use of hand tools, directional boring and or Air Knife excavation where indicated or with other low impact equipment that will not cause damage to the tree, roots or soil.
  - 2. When encountered, exposed roots, 1 inches and larger in diameter must be worked around in a manner that does not break the outer layer of the root surface (bark). These roots must be covered in Wood Chips and must be maintained above permanent wilt point at all times. Roots one inch and larger in diameter must not be cut with out the approval of the owners representative. Excavation must be tunneled under these roots without cutting them. In the areas where roots are encountered, work must be performed and scheduled to close excavations as quickly as possible over exposed roots.
  - 3. Tree branches that interfere with the construction may be tied back or pruned to clear only to the point necessary to complete the work. Other branches must only be removed when specifically indicated by the Owner's Representative. Tying back or trimming of all branches and the cutting of roots must be in accordance with accepted arboricultural practices (ANSI A300, part 8) and be performed under supervision of an ISA Certified Arborist.

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4. Root Protections: Install temporary matting over the Wood Chip Mulch to the extent indicated. Do not permit foot traffic, scaffolding or the storage of materials within the Tree and Plant Protection Area to occur off of the temporary matting.
5. Trunk Protection Wraps: Where indicated on the Tree Preservation Plan, protect the trunk of each tree to remain by wrapping it with a multiple layers of orange plastic fencing, then a ring of 8 foot long 2 inch x 6 inch planks wrapped in two layers of orange plastic fencing and loosely secured to the tree with wire. Trunk protection must be kept in place no longer than 12 months. If construction requires work near a particular tree to continue longer than 12 months, the wraps must be inspected every six months and loosened if they are found to have become tight.

**3.08 PRUNING:**

- A. Within six months of the estimated date of substantial completion, prune all dead or hazardous branches larger than 2 inch in diameter from all trees to remain.
- B. Implement all pruning recommendations found in the arborist report.
- C. Prune any low, hanging branches and vines from existing trees and shrubs that overhang walks, streets and drives, or parking areas as follows:
  1. Walks - within 8 feet vertically of the proposed walk elevation.
  2. Parking areas - within 12 feet vertically of the proposed parking surface elevation.
  3. Streets and drives - within 14 feet vertically of the proposed driving surface elevation.
    - a. All pruning must be done in accordance with ANSI A300 (part 1), ISA BMP Tree Pruning (latest edition, and the "Structural Pruning: A Guide for the Green Industry", Edward Gilman, Brian Kempf, Nelda Matheny and Jim Clark, 2013 Urban Tree Foundation, Visalia CA.
    - b. Perform other pruning task as indicated on the drawings or requested by the Owner's Representative.
    - c. Where tree specific disease vectors require, sterilize all pruning tools between each trees.

**3.09 WATERING**

- A. The Contractor must be fully responsible to ensure that adequate water is provided to all plants to be preserved during the entire construction period. Adequate water is defined to be maintaining soil moisture above the permanent wilt point to a depth of 8 inches or greater.
- B. The Contractor must adjust the automatic irrigation system, if available, and apply additional water, using hoses or water tanks as required.
- C. Periodically test the moisture content in the soil within the root zone to determine the water content.

**3.10 WEED REMOVAL**

- A. During the construction period, control any plants that seed in and around the fenced Tree and Plant Protection area at least three times a year.
  1. All plants that are not shown on the planting plan or on the Tree and Plant Protection Plan to remain must be considered as weeds.
- B. At the end of the construction period provide one final weeding of the Tree and Plant Protection Area.

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3.11 CLEAN-UP

- A. During tree and plant protection work, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
  - 1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.
- B. Once tree protection work is complete, wash all soil from pavements and other structures. Ensure that Mulch is confined to planting beds.
- C. Make all repairs to grades, ruts, and damage to the work or other work at the site.
- D. Remove and dispose of all excess Mulch, Wood Chips, packaging, and other material brought to the site by the Contractor.

3.12 REMOVAL OF FENCING AND OTHER TREE AND PLANT PROTECTION

- A. At the end of the construction period or when requested by the Owner's Representative remove all fencing, Wood Chips or Mulch, Geogrids and Filter Fabric, trunk protection and or any other Tree and Plant Protection material.

3.13 DAMAGE OR LOSS TO EXISTING PLANTS TO REMAIN

- A. Any trees or plants designated to remain and which are damaged by the Contractor must be replaced in kind by the Contractor at their own expense. Trees must be replaced with a tree of similar species and of equal size or 6 inch caliper which ever is less. Shrubs must be replaced with a plant of similar species and equal size or the largest size plants reasonably available which ever is less. Where replacement plants are to be less than the size of the plant that is damaged, the Owner's Representative must approve the size and quality of the replacement plant.
  - 1. All trees and plants must be installed per the requirements of Specification Section Planting.
    - a. Plants that are damaged must be considered as requiring replacement or appraisal in the event that the damage affects more than 25 % of the crown, 25% of the trunk circumference, or root protection area, or the tree is damaged in such a manner that the tree could develop into a potential hazard. Trees and shrubs to be replaced must be removed by the Contractor at his own expense.
  - 2. The Owner's Representative may engage an independent arborist to assess any tree or plant that appears to have been damaged to determine their health or condition.
    - a. Any tree that is determined to be dead, damaged or potentially hazardous by the Owner's arborist and upon the request of the Owner's Representative must be immediately removed by the Contractor at no additional expense to the owner. Tree removal must include all clean up of all wood parts and grinding of the stump to a depth sufficient to plant the replacement tree or plant, removal of all chips from the stump site and filling the resulting hole with topsoil.
    - b. Any remedial work on damaged existing plants recommended by the consulting arborist must be completed by the Contractor at no cost to the owner. Remedial work must include but is not limited to: soil compaction remediation and vertical mulching, pruning and or cabling, insect and disease control including injections,

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compensatory watering, additional mulching, and could include application tree growth regulators (TGR).

- c. Remedial work may extend up to two years following the completion of construction to allow for any requirements of multiple applications or the need to undertake applications at required seasons of the year.

END OF SECTION

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**SECTION 32 11 00**

**PAVEMENT BASE COURSE**

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**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes:

1. Aggregate subbase
2. Aggregate base
3. Cement treated base
4. Lime stabilization

B. Related Sections:

1. Section 31 20 00, Earth Moving
2. Section 31 21 00, Utility Trenching and Backfill
3. Section 01 18 13 Sustainable Design Requirements

C. Related Documents:

1. City of Berkeley Standard Details
2. Geotechnical Report: Geotechnical Investigation Report Willard Park Clubhouse and Restroom Building 2730 Hillegass Avenue Berkeley, California by BKS Associates dated April 13, 2022.
3. ASTM:
  - a. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
  - b. D3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
  - c. E329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
  - d. E548, Guide for General Criteria Used for Evaluating Laboratory Competence

4. Caltrans Standard Specifications, 2022
  - a. Section 24, Stabilized Soils
  - b. Section 25, Aggregate Subbases
  - c. Section 26, Aggregate Bases
  - d. Section 27, Cement Treated Bases

## 1.2 DEFINITIONS

- A. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.
- B. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material  $\frac{3}{4}$  cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D1586, exceeds a standard penetration resistance of 100 blows/2 inches.
- C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below grade.
- D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials. Perform work in accordance with Section 31 20 00, Earth Moving.

## 1.3 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

## 1.4 QUALITY ASSURANCE

- A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Engineer.
- B. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D1557.
- C. Perform installation of base materials under the observation of the Geotechnical Engineer. Materials placed without approval of the Geotechnical Engineer will be presumed to be defective and, at the discretion of the Geotechnical Engineer, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Engineer

at least 24 hours prior to commencement of base material installation and at least 48 hours prior to testing.

- D. Do not mix or place cement treated base when the temperature is below 36 degrees F or when the ground is frozen.
- E. Finish surface of material to be stabilized prior to lime treatment shall be in accordance with Caltrans Standard Specification Section 24, Stabilized Soils.
- F. Finish surface of the stabilized material after lime treatment shall be in accordance with Caltrans Standard Specifications Section 24, Stabilized Soils.
- G. Finish surface of cement treated base shall be in accordance with Caltrans Standard Specification Section 27, Cement Treated Bases.
- H. Do not project the finish surface of aggregate subbase above the design subgrade.
- I. Finish grade tolerance at completion of base installation: +0.05 feet

#### 1.5 PROJECT CONDITIONS

- A. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- B. Temporarily stockpile material in an orderly and safe manner and in a location approved by the Owner.
- C. Provide dust and noise control in accordance with Section 01 10 00, Supplemental General Requirements.

### **PART 2 - PRODUCTS**

#### 2.1 AGGREGATE SUBBASE

- A. Material: Class 1, 2 or 3 in accordance with Caltrans Standard Specification Section 25, Aggregate Subbases.

#### 2.2 AGGREGATE BASE

- A. Material: Class 2 or 3, 1 ½ inch maximum or ¾ inch maximum in accordance with Caltrans Standard Specification Section 26, Aggregate Bases.

#### 2.3 CEMENT TREATED BASE

- A. Material: Class A or B maximum in accordance with Caltrans Standard Specification Section 27, Cement Treated Bases.

#### 2.4 LIME STABILIZED SOILS

- A. Material: In accordance with Caltrans Standard Specification Section 24-2, Lime Stabilized Soil.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

### **3.2 WET WEATHER CONDITIONS**

- A. Do not place or compact subgrade if above optimum moisture content.
- B. If the Geotechnical Engineer allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Engineer.

### **3.3 AGGREGATE SUBBASE**

- A. Spreading and Compacting: In accordance with Caltrans Standard Specification Section 25-1.03D, Spreading and 25-1.03E, Compacting.

### **3.4 AGGREGATE BASE**

- A. Watering, Spreading and Compacting: In accordance with Caltrans Standard Specification Section 26-1.03D, Spreading and 26-1.03E, Compacting.

### **3.5 CEMENT TREATED BASE**

- A. Proportioning and Mixing Plant-Mixed: In accordance with Caltrans Standard Specification Section 27-1.03D.

### **3.6 LIME STABILIZATION**

- A. Lime stabilization shall conform to Caltrans Standard Specification Section 24, Stabilized Soils, and the following:
  1. Add lime in the amount specified by the Geotechnical Engineer.
  2. Lime treat subgrade soils from back of curb to back of curb to a depth specified by the Geotechnical Engineer.
  3. Mix in two mixing periods, both with the tines lowered to the same depth. Both mixing periods shall be monitored and verified by the Geotechnical Engineer. The second mixing shall occur at about 24 hours after the initial mixing.
  4. Compact and grade the lime mixed subgrade immediately after the second mixing.
  5. Compact the lime treated subgrade to 93 percent as determined by ASTM D1557.
  6. After application of the curing seal, do not allow traffic on the lime treated material for a period of 7 days in lieu of the 3 days specified in Caltrans Standard Specifications, Section 24.



7. Proof-roll the stabilized subgrade after compacting to confirm that a non-yielding surface has been achieved. Yielding areas, if any, shall be mitigated. Mitigation could consist of over-excavation, utilization of stabilization fabric, or chemical treatment. Each case shall be addressed individually in the field by the Geotechnical Engineer.

### 3.7 DISPOSAL

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

**END OF SECTION**

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**SECTION 32 13 13**

**CONCRETE PAVEMENT**

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**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes:

1. Furnishing, placing, spreading, compacting and shaping portland cement concrete pavement with undoweled transverse weakened plane joints, for vehicular traffic.
2. Form construction and use in placing portland cement concrete pavement.
3. Joints for portland cement concrete pavement.
4. Finishing portland cement concrete pavement.
5. Curing and protecting portland cement concrete pavement.

B. Related Sections:

1. Section 32 11 00 Pavement Base Course
2. Section 32 13 18 Cement and Concrete for Exterior Improvements
3. Section 32 13 75 Concrete Curb and Gutters
4. Section 32 20 00, Earth Moving
5. Section 01 18 13 Sustainable Design Requirements

C. Related Documents:

1. City of Berkeley Standard Details
2. Geotechnical Report: Geotechnical Investigation Report Willard Park Clubhouse and Restroom Building 2730 Hillegass Avenue Berkeley, California by BKS Associates dated April 13, 2022.
3. AASHTO Standard Specifications
  - a. T132: Standard Method of Test for Tensile Strength of Hydraulic Cement Mortars
4. ASTM Standards

- a. D36: Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
  - b. A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
  - c. A706: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
  - d. A775: Standard Specification for Epoxy Coated Steel Reinforcing Bars.
  - e. A934: Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
  - f. A996: Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
  - g. C94: Standard Specification for Ready-Mixed Concrete
  - h. C603: Standard Test Method for Extrusion Rate and Application Life of Elastomeric Sealants
  - i. C639: Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants
  - j. C661: Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
  - k. C679: ASTM C679-15 Standard Test Method for Tack-Free Time of Elastomeric Sealants
  - l. C719: Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
  - m. C793: Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants
  - n. C881: Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
  - o. D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
  - p. D1640: Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings
  - q. D2628: Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
  - r. D2835: Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements.
  - s. D3963: Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
  - t. D6690: Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
5. Caltrans Standard Specifications, 2022
- a. Section 10, General
  - b. Section 40, Concrete Pavement
  - c. Section 52, Reinforcement
  - d. Section 95, Epoxy
6. Caltrans Standard Plans:
- a. Plan P1: Jointed Plan Concrete Pavement – New Construction
  - b. Plan P10: Concrete Pavement Dowel Bar Details

## 1.2 DEFINITIONS

- A. AASHTO: American Association of State Highway and Transportation Officials
- B. ASTM: American Society for Testing and Materials
- C. Caltrans: State of California, Department of Transportation

## 1.3 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results or other circumstances warrant adjustments.
- C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements.
  - 1. Cementitious materials and aggregates
  - 2. Steel reinforcement and reinforcement accessories
  - 3. Admixtures
  - 4. Curing compound
  - 5. Applied finish material
  - 6. Bonding agent or adhesive
  - 7. Joint filler
  - 8. Joint Sealant
  - 9. Tie Bars
  - 10. Epoxy
  - 11. Backer Rods

## 1.4 QUALITY ASSURANCE

- A. Testing Agency: Owner's Representative will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

- C. **Manufacturer Qualifications:** Manufacturer of ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
- D. **Installer Qualification:** An experienced installer who has completed pavement work similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- E. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

## **PART 2 - PRODUCTS**

### **2.1 PORTLAND CEMENT**

- A. In accordance with Section 32 13 18, Cement and Concrete for Exterior Improvements.

### **2.2 BASE MATERIAL**

- A. In accordance with Section 32 11 00, Pavement Base Course.

### **2.3 TIE BARS**

- A. Deformed reinforcing steel bars conforming to the requirements of ASTM Designation A615, Grade 40 or 60
- B. Epoxy-coat in accordance with Caltrans Standard Specification Section 52-2.02, Epoxy-Coated Reinforcement, except bars must comply with ASTM A706; ASTM A996; or ASTM A615, Grade 40 or 60.
- C. Do not bend tie bars.

### **2.4 EPOXY**

- A. Bond tie bars to existing concrete with epoxy resin in accordance with Caltrans Standard Specification Section 95-1.02D, Epoxy Adhesive for Bonding Freshly Mixed Concrete to Hardened Concrete.

### **2.5 SILICON JOINT SEALANT**

- A. Furnish low modulus silicone joint sealant in a one-part silicone formulation. Do not use acid cure sealants. Compound to be compatible with the surface to which it is applied and conform to the following requirements:

Specification	Test Method	Requirement
Tensile stress, 150% elongation, 7-day cure at 77° ± 1°F and 45% to 55% Relative Humidity	ASTM D412 (Die C)	45 psi max.
Flow at 77° ± 1°F	ASTM C639 <sup>a</sup>	Shall not flow from channel
Extrusion Rate at 77° ± 1°F	ASTM C603 <sup>b</sup>	75-250 g per min.
Specific Gravity	ASTM D792 Method A	1.01 to 1.51
Durometer Hardness, at 0°F, Shore A, cured 7 days at 77° ± 1°F	ASTM C661	10 to 25
Ozone and Ultraviolet Resistance, after 5000 hours	ASTM C793	No chalking, cracking or bond loss
Tack free at 77° ± 1°F and 45% to 55% Relative Humidity	ASTM C679	Less than 75 minutes
Elongation, 7 day cure at 77° ± 1°F and 45% to 55% Relative Humidity	ASTM D412 (Die C)	500 percent min.
Set to Touch, at 77° ± 1°F and 45% to 55% Relative Humidity	ASTM D1640	Less than 75 minutes
Shelf Life, from date of shipment	—	6 months min.
Bond, to concrete mortar-concrete briquets, air cured 7 days at 77° ± 1°F	AASHTO T132 <sup>c</sup>	50 psi min.
Movement Capability and Adhesion, 100% extension at 0°F after air cured 7 days at 77° ± 1°F, and followed by 7 days in water at 77° ± 1°F	ASTM C719 <sup>d</sup>	No adhesive or cohesive failure after 5 cycles

Notes:

1. ASTM Designation: C639 Modified (15 percent slope channel A).
  2. ASTM Designation: C603, through 1/8 inches opening at 50 psi.
  3. Mold briquets in conformance with the requirements in AASHTO Designation: T132, sawed in half and bonded with a 1/16 inches maximum thickness of sealant and tested in conformance with the requirements in AASHTO Designation: T132. Briquets shall be dried to constant mass at 212 ± 10°F.
  4. Movement Capability and Adhesion: Prepare 12 inch x 1 inch x 3 inch concrete blocks in conformance with the requirements in ASTM Designation: C719. A sawed face shall be used for bond surface. Seal 2 inch of block leaving 1/2 inches on each end of specimen unsealed. The depth of sealant shall be 3/8 inches and the width 1/2 inches.
- B. Formulate the silicon joint sealant to cure rapidly enough to prevent flow after application on grades of up to 15 percent.
- C. Furnish to the Owner's Representative a Certificate of Compliance. Accompany certificate with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. Provide the

certificate and accompanying test report for each lot of silicone joint sealant prior to use on the project.

## 2.6 ASPHALT RUBBER JOINT SEALANT

- A. Conform to the requirements of ASTM Designation: D6690 as modified herein or to the following:
  - 1. Provide a mixture of paving asphalt and ground rubber. Ground rubber to be vulcanized or a combination of vulcanized and de-vulcanized materials ground so that 100 percent will pass a No. 08 sieve and contain not less than 22 percent ground rubber, by mass. Modifiers may be used to facilitate blending.
  - 2. The Ring and Ball softening point shall be 135°F minimum, when tested in conformance with the requirements in ASTM D36.
  - 3. Provide asphalt rubber sealant material capable of being melted and applied to cracks and joints at temperatures below 400°F.
- B. The penetration requirements of Section 4.2 of ASTM Designation: D6690 do not apply. The required penetration at 77°F, 5 oz, 5s, shall not exceed 120.
- C. The resilience requirements of Section 4.5 of ASTM Designation: D6690 do not apply. The required resilience, when tested at 77°F, shall have a minimum of 50 percent recovery.
- D. Accompany each lot of asphalt rubber joint sealant shipped to the job site, whether as specified herein or conforming to the requirements of ASTM Designation D6690, as modified herein, by a Certificate of Compliance, storage and heating instructions and precautionary instructions for use.
- E. Heat and place in conformance with the manufacturer's written instructions and the details shown on the Plans. Provide manufacturer's instructions to the Owner's Representative. Do not place when the pavement surface temperature is below 50 °F.

## 2.7 PREFORMED COMPRESSION JOINT SEALANT

- A. Material: ASTM Designation: D2628.
  - 1. Number of cells: 5 or 6.
  - 2. Lubricant Adhesive: ASTM Designation D2835.
  - 3. Install compression seals along with lubricant adhesive according to the manufacturer's recommendations. Submit manufacturer's recommendations to the Owner's Representative`.
- B. Accompany each lot of compression seal and lubricant adhesive by a Certificate of Compliance, storage instructions and precautionary instructions for use. Also submit the manufacturer's data sheet with installation instructions and recommended model or type of preformed compression seal for the joint size and depth as shown on the

Plans. Show evidence that the selected seal is being compressed at level between 20 and 50 percent at all times for the joint width and depth shown on the Plans.

## 2.8 BACKER RODS

- A. Provide backer rods that have a diameter prior to placement at least 25 percent greater than the width of the saw cut after sawing and are expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond, adverse reaction occurs between the rod and sealant. In no case use a hot pour sealant that will melt the backer rod. Submit a manufacturer's data sheet verifying that the backer rod is compatible with the sealant to be used.

## 2.9 SLIP RESISTIVE AGGREGATE FINISH

- A. Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

# PART 3 - EXECUTION

## 3.1 GENERAL

- A. Contractor to refer to Geotechnical recommendations for all exterior concrete flatwork and pavers.
- B. Where concrete flatwork and pavers are exposed to vehicular traffic, the upper 6 inches of the "non-expansive" fill should consist of Caltrans Class 2 aggregate base.
- C. Vehicular pavement shall have a minimum thickness of 6 inches supported over 6 inches of Caltrans Class 2 aggregate base.
- D. The aggregate base and subgrade for Portland Cement Concrete pavements should be properly moisture conditioned and compacted
- E. Construction joints should be located no more than 12 feet apart in both directions.
- F. The Portland Cement Concrete should be continuously reinforced using No. 4 bars (or larger) and spaced no more than 18 inches on center in both directions.

## 3.2 WATER SUPPLY

- A. Provide water supply in accordance with Caltrans Standard Specification Section 10-6, Watering.

## 3.3 SUBGRADE

- A. Prepare subgrade in accordance with Caltrans Standard Specification Section 40-1.03F, Placing Concrete.

## 3.4 SOIL STERILANT

- A. Furnish and apply to areas indicated in accordance with Section 31 20 00, Earth Moving.



### 3.5 PLACING

- A. Prepare concrete in accordance with Caltrans Standard Specification Section 40-1.03F, Placing Concrete.

### 3.6 SPREADING COMPACTING AND SHAPING

- A. Contractor to conform to one of the following:
  - 1. Stationary Side Form Construction: In accordance with Caltrans Standard Specification Section 40-1.03F(4), Stationary Side-Form Construction.
  - 2. Slip Form Construction: In accordance with Caltrans Standard Specification Section 40-1.03F(4), Slip Form Construction.

### 3.7 INSTALLING TIE BARS

- A. Install at longitudinal contact joints, longitudinal weakened plane joints, and transverse contact joints as shown on the Plans. In no case, shall any consecutive width of new Portland cement concrete pavement tied together with tie bars exceed 50 feet. In no case shall tie bars be used at a joint where Portland cement concrete and asphalt concrete pavements abut.
- B. Tie bars shall be installed at longitudinal joints by one of the 3 following methods:
  - 1. Drilling and bonding in conformance with the details shown on the Plans. Provide a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C881, Type V. Grade 3 (Non-Sagging), Class shall be as follows:

<u>Temperature of Concrete</u>	<u>Required Class of Epoxy Resin</u>
Lower than 40° F	A
40° F through 60° F	B
Above 60° F	C

- 2. Provide, at least 7 days prior to start of work, a Certificate of compliance and a copy of the manufacturer's recommended installation procedure. The drilled holes shall be cleaned in accordance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during the curing and shall remain undisturbed until the epoxy has cured a minimum time as specified by the manufacturer. Tie bars that are improperly bonded, as determined by the Owner's Representative, will be rejected. If rejected, adjacent new holes shall be drilled, as directed by the Owner's Representative, and new tie bars shall be placed and securely bonded to the concrete. All work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.
- 3. Insert the tie bars into the plastic slip-formed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refinished to such an extent that there is no evidence on the surface of the completed pavement that there has been any insertion performed. Any loose tie bars shall be replaced by drilling and grouting into place with epoxy as described in method 1 above at the Contractor's expense.
- 4. By using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be

accompanied by a Certificate of Compliance and installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.

### 3.8 JOINTS

- A. Construct joints in accordance with Caltrans Standard Specification Section 40-1.03B, Joints, except that tie bars shall be as specified under Part 1, Materials.
  - 1. Construction Joints: In accordance with Caltrans Standard Specification Section 40-1.03B(2), Construction Joints.
    - a. Construct a construction joint at the end of each day's work, or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.
    - b. If sufficient concrete has not been mixed to form a slab to match the next contraction joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of any excess concrete shall be at the Contractor's expense. Any excess material shall become the property of the Contractor and shall be properly disposed of.
    - c. A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of tie bars.
  - 2. Contraction Joints: In accordance with Caltrans Standard Specification Section 40-1.03B(3), Contraction Joints, except that the insert method of forming joints in pavement shall not be used.

### 3.9 FINISHING

- A. Finish concrete in accordance with Caltrans Standard Specification Section 40-1.03H, Finishing.
- B. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
  - 1. Uniformly spread [25 lb per 100 sq. ft.] [40 lb per 100 sq. ft.] [60 lb per 100 sq. ft] of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
  - 2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.

### 3.10 CURING

- A. Cure concrete in accordance with Caltrans Standard Specification Section 40-1.03I, Curing.

### 3.11 SEALING JOINTS

- A. Liquid Joint Sealant Installation.

1. The joint sealant detail for transverse and longitudinal joints, as shown on the Plans, shall apply only to weakened plane joints. Construct weakened plane joints by the sawing method. Should grinding or grooving be required over or adjacent to any joint after sealant has been placed, completely remove the joint material and disposed of, and replace at the Contractor's expense. Recess sealant below the final finished surface as shown on the Plans.
2. At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the Plans. Longitudinal weakened plane joints shall be Type SSC only as shown on the Plans.
3. Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, clean the joint walls by the dry sand blast method and other means as necessary to completely remove from the joint all objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, remove all traces of sand, dust and loose material from and near the joint for a distance along the pavement surfaces of at least 2 inch on each side of the joint by the use of a vacuum device. Remove surface moisture at the joints by means of compressed air or moderate hot compressed air or other means approved means. Do not use drying procedures that leave a residue or film on the joint wall. Sandblasting equipment shall have a maximum nozzle diameter size of 1/4 + 1/32 inches and a minimum pressure of 90-psi.
4. Install backer rod as shown on the Plans. Provide an expanded, closed-cell polyethylene foam backer rod that is compatible with the joint sealant so that no bond or adverse reaction occurs between the rod and sealant. Install backer rod when the temperature of the Portland cement concrete pavement is above the dew point of the air and when the air temperature is 40°F or above. Install backer rod when the joints to be sealed have been properly patched, cleaned and dried. Do not use a method of placing backer rod that leave a residue or film on the joint walls.
5. Immediately after placement of the backer rod, place the joint sealant in the clean, dry, prepared joints as shown on the Plans. Apply the joint sealant by a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Apply adequate pressure to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant recess the surface of the sealant as shown on the Plans.
6. Any failure of the joint material in either adhesion or cohesion of the material will be cause for rejection of the joint. Conform the finished surface of joint sealant to the dimensions and allowable tolerances shown on the Plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the Plans shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.
7. After each joint is sealed, remove all surplus joint sealer on the pavement surface. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

B. Preformed Compression Joint Seal Installation

1. The compression seal alternative joint detail for transverse and longitudinal joints, as shown on the Plans, shall apply only to weakened plane joints. Construct weakened plane joints by the sawing method. Should grinding or grooving be required over or adjacent to any joint after the compression seal has been placed, completely remove the joint materials and disposed of, and replace at the Contractor's expense. Compression seal shall be recessed below the final finished surface as shown on the Plans.

2. At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the Plans. Longitudinal weakened plane joints shall be Type SSC only as shown on the Plans.
3. Seven days after the concrete pavement placement and not more than 4 hours before placing preformed compression joint seals, clean clean the joint walls by the dry sand blast method and other means as necessary to completely remove from the joint all objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, remove all traces of sand, dust and loose material from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Remove surface moisture at the joints by means of compressed air or moderate hot compressed air or other means. Do not use drying procedures that leave a residue or film on the joint wall. Sandblasting equipment shall have a maximum nozzle diameter size of  $1/4 \pm 1/32$  inches and a minimum pressure of 90 psi.

### 3.12 PROTECTING CONCRETE PAVEMENT

- A. Protect pavement in accordance with Caltrans Standard Specification Section 40-1.03J Protecting Concrete Pavement.

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

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**SECTION 32 13 18**

**CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS**

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**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes:

1. Materials for Portland cement concrete
2. Aggregate and aggregate grading for Portland cement concrete
3. Water for Portland cement concrete
4. Admixtures for Portland cement concrete
5. Proportioning for Portland cement concrete
6. Mixing and transporting Portland cement concrete
7. Formwork for cast in place Portland cement concrete
8. Embedded materials for Portland cement concrete
9. Steel reinforcement for Portland cement concrete
10. Placing and finishing Portland cement concrete
11. Curing Portland cement concrete
12. Protecting Portland cement concrete

B. Related Sections:

1. Section 32 11 00 Pavement Base Course
2. Section 32 13 13 Concrete Pavement
3. Section 32 13 75 Concrete Curb and Gutters
4. Section 31 21 00, Utility Trenching and Backfill
5. Section 01 18 13 Sustainable Design Requirements

C. Related Documents:

1. City of Berkeley Standard Details
2. Geotechnical Report: Geotechnical Investigation Report Willard Park Clubhouse and Restroom Building 2730 Hillegass Avenue Berkeley, California by BKS Associates dated April 13, 2022.

D. ASTM Standards

1. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
2. A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
3. C94, Standard Specification for Ready-mixed Concrete
4. C150, Standard Specification for Portland Cement
5. C260, Standard Specification for Air-Entraining Admixtures for Concrete
6. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
7. C494, Standard Specification for Chemical Admixtures for Concrete.
8. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Portland Cement
9. C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
10. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
11. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

E. Caltrans Standard Specifications, 2022

1. Section 51: Concrete Structures
2. Section 73: Concrete Curbs and Sidewalks
3. Section 90: Concrete

1.2 DEFINITIONS

A. ASTM: American Society for Testing and Materials

### 1.3 SUBMITTALS

- A. Concrete Mix Design: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the Plans. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.
- B. Reinforcing Steel Shop-Drawings

### 1.4 QUALITY ASSURANCE

- A. Concrete shall be subject to quality assurance in accordance with Section 90 of the Caltrans Standard Specifications.
  - 1. Slump tests: Have available, at job site, equipment required to perform slump tests. Make one slump test for each cylinder sample, from same concrete batch. Allowable maximum slump shall be 4 inches for walls and 3 inches for slabs on grade and other work.
- B. Certifications:
  - 1. Provide Owner's Representative at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:
    - a. Materials contained comply with the requirements of the Contract Documents in all respects.
    - b. Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.
    - c. Statement of type and amount of any admixtures.
  - 2. Provide Owner's Representative, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.

### 1.5 DESIGNATION

- A. General: Whenever the 28-day compressive strength is designated herein or on the Plans is 3,600 psi or greater, the concrete shall consider to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are less than 3,600 psi are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the Plans, the concrete shall contain the cement per cubic yard shown in Section 90-2 of the Caltrans Standard Specifications.

- B. Unless specified otherwise herein or on the Plans, Portland cement concrete for curbs, gutters, sidewalks and their appurtenances such as island paving, curb ramps and driveways, shall be minor concrete as specified in Section 90-2 of the Caltrans Standard Specifications.

## **PART 2 - PRODUCTS**

### **2.1 PORTLAND CEMENT**

- A. General: Type II or Type V cement conforming to the requirements of ASTM C150. Contractor may substitute pozzolan for Portland cement in amounts up to 15% of the required mix unless high early strength concrete is specified. Pozzolan shall consist of Class F Fly Ash meeting the requirements of ASTM C618.
- B. Color: Provide a coloring equivalent to ¼ pound of lampblack per cubic yard. Add to the concrete at the central mixing plant.

### **2.2 AGGREGATE AND AGGREGATE GRADATION**

- A. General: Fine and coarse aggregates shall be ¾ inch maximum size; clean and crushed aggregate free of materials which may cause staining. Aggregates shall conform to the requirements of section 90-1.02C of the Caltrans Standard Specifications.
- B. Aggregate Size and Gradation: Conform to the requirements of section 90-1.02C(4)(d) of the Caltrans Standard Specifications for 1-inch maximum combined aggregate.

### **2.3 WATER**

- A. General: Water shall be clean, free from injurious amounts of oil, alkali, organic matter, or other deleterious material, and not detrimental to concrete per ASTM C94. Water shall conform to the requirements of section 90-1.02D of the Caltrans Standard Specifications, for mixing and curing Portland cement concrete and for washing aggregates.

### **2.4 CHEMICAL ADMIXTURES**

- A. Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material. Admixtures shall conform to the requirements of section 90-1.02E of the Caltrans Standard Specifications and as noted herein or on the Plans.
  - 1. Air-Entraining Admixture: ASTM C260/C260M
  - 2. Water-Reducing Admixture: ASTM C494/C494M, Type A
  - 3. Retarding Admixture: ASTM C494/C494M, Type B
  - 4. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D



5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G
7. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II

## 2.5 CLASSIFICATION OF PORTLAND CEMENT CONCRETE

- B. Unless specified otherwise herein or on the Plans, portland cement concrete for the following items shall be designated as follows:
1. Curbs, Gutters, and Sidewalks: Minor concrete.
  2. Cast in Place Concrete Pipe: The concrete shall consist of a minimum of 564 pounds of portland cement per cubic yard of concrete.
  3. Thrust Blocks: The concrete shall have a minimum compressive strength of 3,000 psi.
  4. Sign and Fence Footings: The concrete shall consist of a minimum of 376 pounds of portland cement per cubic yard of concrete.
  5. Water, Storm, and Sanitary Structures: The concrete shall consist of a minimum of 564 pounds of portland cement per cubic yard of concrete.

## 2.6 EXPANSION JOINT MATERIAL

- A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM D1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site. Unless specified otherwise herein or on the Plans, expansion joint thickness shall be as follows:
1. Concrete Slope Protection, Gutter Lining, Ditch Lining and Channel Lining:  $\frac{1}{2}$  inch
  2. Structures: As indicated

## 2.7 REINFORCEMENT AND DOWELS

- A. Bar reinforcement for concrete improvements shall be deformed steel bars of the size or sizes called for on the plans conforming to the requirements of ASTM A615 for Grade 60 bars. Size and shape for bar reinforcement shall conform to the details shown or called for on the Plans. Substitution of wire mesh reinforcement for reinforcing bars will not be allowed.
- B. Slip dowels, where noted or called for on the Plans or detail drawings shall be smooth billet-steel bars as designated and conforming to the requirements of ASTM A615 for

Grade 60 bars. Ends of bars inserted in new work shall be covered with a cardboard tube sealed with cork; no grease or oil shall be used.

- C. Mesh for reinforcement for concrete improvements shall be cold drawn steel wire mesh of the size and spacing called for on the plans conforming to the requirements of ASTM A1064. Size and extent of mesh reinforcement shall conform to the details shown or called for on the plans.
- D. Tie wire for reinforcement shall be eighteen (18) gauge or heavier, black, annealed conforming to the requirements of ASTM A1064.
- E. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

## 2.8 COLOR AND PATTERN FOR DECORATIVE SURFACES

- A. Colors for decorative surfacing shall be CHROMIX admixtures as manufactured by the L. M. Scofield Company, Schedule A-312.05 or approved equal. See Landscape plan for pavement color and pattern.
- B. Patterns for decorative surfacing shall be standard "Bomanite" patterns as copyrighted by the Bomanite Corporation of Palo Alto, California or equal. See Landscape plan for pavement color and pattern.

## 2.9 CURING AND SEALING MATERIALS

- A. Curing Compounds:
  - 1. Concrete surface repellent-vertical and/or flatwork: Repello surface treatment, invisible chemical treatment barrier system.
  - 2. Curing and sealing-exterior: Colorcure concrete cureseal manufactured by L.M. Scofield Company or approved equal. Color-matched, water-based curing and sealing compound that complies with ASTM C309.
  - 3. Color Conditioned Decorative Portland Cement Concrete: LITHOCHROME colorwax manufactured by L.M. Scofield Company or approved equal. Color-matched, water-based curing and sealing compound that complies with ASTM C309.

## 2.10 FORMS

- A. Conform to the requirements of Section 73-1.03C and Section 90-1.03B(5) of the Caltrans Standard Specifications.
- B. Tolerance: Not to deviate more than ¼ inch in 10 feet in grade and alignment.

## 2.11 PRECAST STRUCTURES

- A. Conform to the following Sections of Caltrans Standard Specifications:
  - 1. 51-7, Minor Structures

## 2. 70-5.02, Flared End Sections

### 2.12 CONCRETE VEHICULAR PAVEMENT

- A. General: See Section 32 13 13, Concrete Pavement.

## **PART 3 - EXECUTION**

### 3.1 GENERAL

- A. Contractor to refer to Geotechnical recommendations for all exterior concrete flatwork and pavers.
- B. All Exterior flatwork and pavers are to be supported on a minimum 12 inches of "non-expansive" fill. Where concrete flatwork and pavers are exposed to vehicular traffic, the upper 6 inches of the "non-expansive" fill should consist of Caltrans Class 2 aggregate base.
- C. New Pedestrian concrete flatwork should have a minimum thickness of 4 inches and minimum reinforcing of #4 bars at 18 inches on center (both ways). The rebar should be discontinued at expansion joints. Slip dowels should be used at expansion joints.
- D. Exterior flatwork should have control joints spaced no more than 8 feet on centers. Prior to construction of the flatwork and pavers, the aggregate base should be moisture conditioned to near optimum moisture content.
- E. Expansion joint material should be used between flatwork/pavers and buildings, including concrete driveways.

### 3.2 STRUCTURAL EXCAVATION

- F. Structural excavation may be either by hand, or by machine and shall be neat to the line and dimension shown or called for on the plans. Excavation shall be sufficient width to provide adequate space for working therein, and comply with CAL-OSHA requirements.
- G. Where an excavation has been constructed below the design grade, refill the excavation to the bottom of the excavation grade with approved material and compact in place to 95% of the maximum dry density as determined by ASTM D1557.
- H. Remove surplus excavation material remaining upon completion of the work from the job site, or condition it to optimum moisture content and compact it as fill or backfill on the site.

### 3.3 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

- C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Consulting Engineer for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### 3.4 PLACING CONCRETE FORMS

- A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.
- B. Thoroughly clean all forms prior to placement and coat forms with an approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.
- C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.
- D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

### 3.5 PLACING STEEL REINFORCEMENT

- A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. All bending shall be done cold, to the shapes shown on the plans. The length of lapped splices shall be as follows:
  - 1. Reinforcing bars No. 8, or smaller, shall be lapped at least 45 bar diameters of the smaller bar joined, and reinforced bars Nos. 9, 10, and 11 shall be lapped at least 60 bar diameters of the smaller bars joined, except when otherwise shown on the plans.
  - 2. Splice locations shall be made as indicated on the plans.
- B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads. Provide supports

and ties of such strength and density to permit walking on reinforcing without undue displacement.

- C. Place reinforcing to provide the following minimum concrete cover:
  - 1. Surfaces exposed to water: 4 inches.
  - 2. Surfaces poured against earth: 3 inches.
  - 3. Formed surfaces exposed to earth or weather: 2 inches.
  - 4. Slabs, walls, not exposed to weather or earth: 1 inch.
- D. Minimum spacing, center of parallel bars shall be two and one half (2 ½) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

### 3.6 MIXING AND TRANSPORTING PORTLAND CEMENT CONCRETE

- A. Transit mix concrete in accordance with the requirements of ASTM Designation C94. Transit mix for not less than ten (10) minutes total, not less than three (3) minutes of which shall be on the site just prior to pouring. Mix continuous with no interruptions from the time the truck is filled until the time it is emptied. Place concrete within one hour of the time water is first added unless authorized otherwise by the Owner's Representative.
- B. Do not hand mix concrete for use in concrete structures.

### 3.7 PLACING PORTLAND CEMENT CONCRETE

- A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.
- B. Do not place concrete until the subgrade and the forms have been approved.
- C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.
- D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Owner's Representative. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.
- E. Concrete in certain locations may be pumped into place upon prior approval by the Owner's Representative. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

### 3.8 PLACING ACCESSORY MATERIALS

- A. Place water stops and other items required to be embedded in of portland cement concrete structures at locations shown or required in accordance with Section 51-2.04 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans.
- B. Curing Compounds:
  - 1. Regular Portland Cement Concrete: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - 2. Color Conditioned Decorative Portland Cement Concrete: Apply in accordance with the manufacturer's written instructions.

### 3.9 FORM REMOVAL

- A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.
- B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.
- C. Leave forms for cast-in-place walls in place at least 72 hours after pouring.
- D. Leave edge forms in place at least 24 hours after pouring.

### 3.10 DECORATIVE SURFACING CONSTRUCTION

- A. Decorative surfacing concrete walks, concrete median islands or other installations shall be formed and placed as a concrete slab conforming to the details shown or noted on the Landscaping Plans.

### 3.11 FIELD QUALITY CONTROL

- A. Finish subgrade for concrete improvements shall be subject to approval prior to placement of forms.
- B. No concrete shall be placed prior to approval of forms.
- C. Concrete improvements constructed shall not contain "bird baths" or pond water and shall be smooth and ridge free.
- D. Conform the finish grade and cross section of concrete improvements to the design grades and cross sections.
- E. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances ACI 117 and as follows:
  - 1. Elevation:  $\frac{1}{4}$  inch.

2. Thickness: Plus  $\frac{3}{8}$  inch, minus  $\frac{1}{4}$  inch.
3. Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed  $\frac{1}{4}$  inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels:  $\frac{1}{4}$  inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge:  $\frac{1}{2}$  inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel  $\frac{1}{4}$  inch per 12 inches.
8. Joint Spacing: 3 inches, unless otherwise indicated.
9. Contraction Joint Depth: Plus  $\frac{1}{4}$  inch, no minus.
10. Joint Width: Plus  $\frac{1}{8}$  inch, no minus.

### 3.12 RESTORATION OF EXISTING IMPROVEMENTS

- A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.
- B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

**END OF SECTION**

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**SECTION 32 14 00**

**UNIT PAVERS**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish all labor, materials, tools, equipment and appliances necessary to install precast concrete unit paving as indicated on Drawings, and as specified herein; including components and accessories required for a complete installation, including but not limited to the following components:
1. Apply pre-emergent herbicide or ensure weeds have been eradicated where pavers are base set on-grade. Do not apply when installed over concrete base.
  2. Install setting bed.
  3. Install pavers.
  4. Provide extra pavers of each color and thickness equal for an additional 200 square feet of replacement pavers.

**1.02 RELATED SECTIONS**

- A. Earthwork: Section 31 20 00
- B. Planting: Section 32 90 00
- C. Planting Irrigation: Section 32 84 00

**1.03 SUBMITTALS**

- A. Submit three samples of each shape and color paver to be supplied.
- B. Manufacturer's data: Submit manufacturer's pavers specifications, installation instructions, required certifications and test reports.
- C. Make all submittals at one time. No submittals will be reviewed until the entire package has been provided for review.

**1.04 QUALITY ASSURANCE**

- A. Install pavers in accordance with manufacturer's instructions.

**1.05 PRODUCT HANDLING AND RECYCLING**

- A. Deliver and unload pavers at jobsite on pallets and bound in such a manner that no damage occurs to the product during hauling, handling or unloading.

**1.06 DEFINITIONS**

- A. The "Owner's Representative" is the person, appointed by the Owner, to represent their interests. The Owner's Representative will be on site frequently and regularly



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during construction. Where needed, the Owner's Representative will identify the need for field visits by the landscape architect or other consultants.

**PART 2 - PRODUCTS**

**2.01 CONCRETE UNIT PAVERS**

A. Manufacturer:

1. Provide all pavers in accordance with the manufacturer and patterns as shown on the Drawings or approved equivalent.

B. Use pavers conforming to ASTM C-936 and the following specifications:

1. Pavers having a minimum compressive strength of 8000 psi in accordance with testing procedure ASTM C-140.
2. Materials used to manufacture pavers conforming to ASTM C-150 (Portland cement) and ASTM C-33 (Aggregate).

C. Molds:

1. Provide new molds for each shape and size of pavers to ensure minimum deviation of units.
2. All dimensions are to be finished dimensions from center line of joint.
  - a. Finished stone modular dimensions to be as shown on Drawings.

D. Colors:

1. As specified on Drawings.
2. Each color to match approved samples for color. Owner's Representative to determine correct match.

**2.02 BASE AGGREGATE**

- A. Washed Class 2, per Caltrans Specification Section 26 or as stated on the Drawings and Geotechnical Report.

**2.03 OTHER MATERIALS**

- A. All other materials not specifically described but required for a complete and proper installation of pavers to be as selected by the Contractor subject to approval by Owner's Representative prior to installation.

**PART 3 - EXECUTION**

**3.01 INSPECTION AND GROUND PREPARATION**

- A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. In the event of discrepancy, immediately notify Owner's Representative. Do not proceed with installation in areas of discrepancy until all such discrepancies have been completely resolved.

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- B. Apply herbicide to subgrade one day prior to installing sand bed. Apply in strict accordance with manufacturer's installation instructions and recommended application rates.
- C. Fine grade existing subgrade to ensure final grade as indicated on drawings.

**3.02 INSTALLATION**

- A. Base Aggregate: Place and compact processed aggregate base as noted on Drawings, in accordance with Caltrans Specifications Section 25 (and Section 26 in roadway areas), with the following exceptions:
  - 1. Compact the subgrade soils to a minimum of 95% of the maximum dry density in accordance with ASTM D-1557,
  - 2. Aggregate at a depth of 18 inches in roadway areas and 6 inches in pedestrian areas, unless noted otherwise.
- B. Pavers:
  - 1. Clean pavers and make free of foreign materials before installation.
  - 2. Install paving work plumb, level, and true to line and grade.
  - 3. Install pavers in pattern and layout as shown on drawings.
  - 4. Cut all pavers with a masonry saw.
  - 5. Install pavers hand tight and level on the undisturbed sand laying course with tolerance from given dimensions not to exceed 3/8-inch in 100 feet.
  - 6. Use string lines to hold pattern lines true.

**3.03 CLEAN-UP**

- A. Inspection and Adjustment: Upon the completion of the work of this Section, make a thorough inspection of all installed surfaces and verify that all work has been installed in accordance with the provisions of this Section. Make all necessary repairs.
- B. Clean up all waste. Remove and recycle surplus pavers and other materials from the job, and satisfactorily clean materials adjacent of all stains or dirt resulting from this operation.

**END OF SECTION**

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**SECTION 32 15 40**

**DECOMPOSED GRANITE PAVING**

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**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section Includes: Furnish all labor, materials, tools and equipment necessary to install decomposed granite paving as indicated on the plans and as specified herein; including components and accessories required for a complete installation, for Decomposed Granite Paving.
- B. Related Requirements
  - 1. Section 312200, Grading

1.02 PRICE AND PAYMENT PROCEDURES

- A. Refer to Section 012000, Price and Payment Procedures.

1.03 REFERENCES

- A. Standards: Comply with pertinent provisions of following standards, in case of conflict between referenced standards, the more stringent requirements shall govern.
  - 1. ASTM, latest edition.
  - 2. AASHTO Specifications for Materials, latest edition.
- B. Standard Specifications: Conform to all applicable requirements of the Standard Specifications listed below, whether specifically referred to or not, except as modified hereinafter.
  - 1. CalTrans Standard Specifications.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling
  - 1. Inspection: The City will determine the location, timing, and number of compaction tests to assure that specified requirements are met.

1.05 SUBMITTALS

- A. Product Data
  - 1. Soil Sterilant: Submit written recommendation from a State of California appropriately licensed individual along with complete product data from proposed manufacturer, for review by Engineer.
  - 2. Decomposed Granite
    - a. Sieve analysis of aggregate materials.
    - b. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
    - c. Certificates of compliance with the specified standards for natural materials and manufactured items.
  - 3. Material list of items proposed to be furnished under this section.
- B. Samples
  - 1. Decomposed Granite Paving with stabilizer: Contractor shall submit a 5 lb. sample of decomposed granite and 1 lb. stabilizer to the Engineer for approval prior to delivery of material to the site.
  - 2. The Contractor shall demonstrate to the satisfaction of the Engineer that he or his subcontractor possesses the skills to perform the work in all aspects required.

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3. A five-square-foot sample of decomposed granite paving shall be installed at the site for the Engineer's review and approval. The Contractor shall meet or exceed that quality of work in all subsequent work. Contractor shall be responsible for the removal of the sample at the completion of work.
    - a) Schedule mock-up construction so that mock-up can be accepted a minimum of 30 days prior to the application of paving surfaces represented by the mock-up.
    - b) Locate mock-up in areas as directed by the Engineer.
    - c) Continue to construct mock-ups until acceptable mock-up is produced. Acceptable mock-up shall be standard for texture, color and workmanship.
    - d) Use same setting bed and joint mixes used in accepted mock-up in final work unless otherwise directed by Owner's Representative.
    - e) Mock-up to demonstrate fully stabilized surface and ADA accessibility.
- 1.06 QUALITY ASSURANCE
- A. Tests and Inspections
    1. The City will provide a qualified testing laboratory to observe and test placement of aggregate in accordance with the specifications.
    2. Tests will include inspection of subgrade prior to placing aggregate, inspection and testing of materials after mixing, and compaction tests to determine compliance with specification requirements.
  - B. Grading Tolerance: Construct grades described in this section within a tolerance of plus or minus five hundredths (0.05) foot maximum variation in any ten foot length from the grades shown on drawings.
  - C. Surface Drainage: No area of the finished paving will hold water.
  - D. Compaction testing to be provided by contractor, one test per 2,000 square feet of base course.
  - E. Qualifications of Workers: Provide at least one person who shall be thoroughly trained and experienced in the skills required, completely familiar with the design and application of work described for this section and present at all times during progress of the work of this section and direct all work performed under this section.
  - F. Manufacturer's technical representative shall visit the site at the start of an installation to ensure the installer understands the correct installation methods to use.
- 1.07 DELIVERY, STORAGE, AND HANDLING
- A. Materials: Attention is directed to Section 6, Control of Materials of the City Standard Specifications and these Special Provisions. All materials required to complete the work under this contract shall be furnished by the Contractor.
- 1.08 SITE CONDITIONS
- A. Protection from Water Accumulation: Perform all operations in a manner which continuously allows proper disposal of surface run-off and prevents accumulation of water potentially causing soft areas impeding Work. Before leaving after each work day perform such operations as may be necessary to minimize possible damage or work slowdown caused by rain.
- 1.09 WARRANTY
- A. Final Guarantee: Contractor shall provide guarantee per Section 7-1.23, Final Guarantee of the City Standard Specifications.
  - B. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

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- C. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of Stabilized Aggregate that fail in materials or workmanship within the specified warranty period. Stabilizer Solutions, Inc. does not warranty “Stabilizer®” purchased from a non-approved Stabilizer Solutions, Inc. licensee. Failures include, but are not limited to, the following:
  - 1. Premature wear and tear, provided the material is maintained in accordance with manufacturer’s written maintenance instructions.
  - 2. Failure of system to meet performance requirements.
- D. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.
- E. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

**PART 2 - PRODUCTS**

2.01 DECOMPOSED GRANITE PAVING

- A. Clean selected decomposed granite. Evenly mix fines throughout the aggregate. Color to be approved by Owner’s Representative and by Stabilizer Solutions.
- B. Color: 100% Gray fines.
- C. The sand equivalent shall be in the range of 35-55. The R-value shall be a minimum of 71. ASTM testing shall be used for the sand equivalent and R-value determination.
- D. Dense graded crushed stone base shall be furnished and installed as required and specified to a 6” compacted depth.
- E. Gradation requirements shall be as follows:

U.S. Sieve No.	Percent Passing by Weight
# 1/2"	95 – 100
# 3/8"	90 – 100
# 4	65 – 80
# 8	48 – 63
# 16	40 – 49
# 30	30 – 40
# 50	20 – 27
# 100	10 – 18
# 200	10 - 12

2.02 STABILIZER

- A. Manufacturers
  - 1. Stabilizer Solutions of Phoenix, Arizona (1-800-336-2468) or approved equal as supplied by Supply Side Products (888) 222-4341 or approved equivalent.
- B. Description
  - 1. Stabilizer™ binder additive. The organic binding agent shall be a premium non-toxic, colorless, odorless, non-staining concentrated powder that binds decomposed granite together to provide a natural appearing firm surface.

**PART 3 - EXECUTION**

3.01 PREPARATION

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- A. Protection of In-Place Conditions
  - 1. Surrounding areas, surfaces and appurtenances already in place shall be protected during installation of decomposed granite paving.
- B. Surface Preparation
  - 1. Prior to any installation, the area shall be treated with weed control treatment and pre-emergent treatment per Section 329100, Planting Preparation.
  - 2. Immediately prior to placing the decomposed granite, the subgrade shall be moistened.
- C. Base shall be 6" compacted layer of the state's DOT recommended crushed granular road base. Make any corrections necessary to base furnished and installed to bring gravel to the elevations shown on the drawing.
- D. Pre-soak base material with water and compact to 95% determined by Test Method ASTM D 1557 prior to installing Stabilized Aggregate. Compaction testing to be provided by project owner, one test per 2,000 square feet of base.
- E. Although porous, it is recommended to have proper drainage available to ensure no standing water on surface or adjacent to Stabilized Aggregate, including downspouts when placed under roof overhang and surface drains.
- F. Before proceeding with installation, notify Owner's Representative in writing of unsuitable site/base conditions.
- G. Blending: Stabilizer shall be thoroughly pre-mixed with aggregate at the rate of 15-lbs of Stabilizer per 1-ton of aggregate. Verify with Stabilizer Solutions, Inc. for correct Stabilizer rate for project and climate conditions. Drop spreading of Stabilizer over pre-placed aggregate or mixing by rototilling is not acceptable for vehicular access. Stabilizer shall be mechanically pre-mixed per manufacturer's recommendations using an approved mechanical blending unit that will adequately mix and blend Stabilizer with aggregate (Bucket blending is not an approved blending apparatus). Always blend Stabilizer and aggregate DRY.

**3.02 INSTALLATION**

- A. Placement: Place the Stabilized Aggregate directly on a prepared base, and rake smooth to desired grade and cross section. Place material to sufficient depth to allow 4" for residential or 5" for commercial after compaction. Installation of Stabilized Aggregate to be installed in lifts. If 3" thick compacted for paths (2) 1.5" lifts. If 4" thick compacted for vehicular (2) 2" lifts. If Stabilized Aggregate is pre-moistened before installation entire 3" or 4" lift may be installed. DO NOT place on filter fabric. Contact Stabilizer Solutions, Inc. for installation on slopes greater than 8%.
- B. Watering
  - 1. Water heavily for full-depth moisture penetration of profile. Water activates Stabilizer, saturate to total depth. Apply 25 to 45-gallons of water per 1-ton. Application test moisture using a probing device reaching full depth.
  - 2. Contractor shall wait a minimum of 6 – 72 hours or until such time that the Stabilized Aggregate is able to accept compaction from a 2 to 5 ton roller without separation, plowing or any other physical compromise of the aggregate.
- C. Compaction
  - 1. Compact Stabilized Aggregate to 85% relative compaction by equipment such as; a 2 to 5-ton double drum roller making 3 to 4 passes. Do not begin compaction for 6 hours after placement and up to 72 hours. DO NOT use a vibratory plate compactor or vibration feature on roller, as vibration separates large aggregate particles. If pumping or pancaking of surface occurs, surface is still too wet to roll.
  - 2. Take care in compacting Stabilized Aggregate when adjacent to planting and irrigation systems. Hand tamping with 8" or 10" hand tamp recommended.
  - 3. Lightly spray surface area following compaction. Do not disturb aggregate surface with spray action.
- D. Finish

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1. Finished surface shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted surface shall be firm throughout profile with no spongy areas. Loose material shall not be present on the surface after installation, but may appear after use and according to environmental conditions. Surface shall remain stable underneath the loose granite on top with a 'natural' look. Any significant irregularities in Stabilized Aggregate surface shall be repaired to the uniformity of entire installation.

**3.03 CLEANING**

- A. Planting Areas: All excess decomposed granite shall be removed from planting areas.

**3.04 PROTECTION**

- A. General: Following construction of each layer and following completion of the decomposed granite paving take all required measures necessary to prevent or repair segregation, raveling or rutting, and to maintain the layer in the specified condition until it is covered with a following layer or until all work is completed.
- B. Repairs:
  1. Excavate damaged area to the depth of the Stabilized Aggregate and square off sidewalls.
  2. If area is dry, moisten damaged portion lightly.
  3. Pre-blend the dry required amount of Stabilizer® powder with the proper amount of aggregate in a concrete mixer.
  4. Add water to the pre-blended Stabilized Aggregate. Thoroughly moisten mix with 25 to 45 gallons per ton of pre-blended material or to approximately 10% moisture content.
  5. Apply moistened pre-blended Stabilized Aggregate to excavated area to finish grade.
  6. Compact with an 8" to 10" hand tamp or use a larger 1000 lb. roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.

**END OF SECTION**

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**SECTION 32 31 14**

**SITE FENCING**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Provide, furnish, and install all fencing and gates, as shown and as specified with all related appurtenances and incidentals as required, including fencing and handrails.
- B. Fence Types include metal and wooden fencing.

**1.02 RELATED SECTIONS**

- A. Landscape Concrete Work: Section 03 31 00
- B. Hardware: Section 08 71 00
- C. Concrete: Section 02 75 10
- D. Graffiti Resistant Coating: Section 09 26 20

**1.03 SUBMITTALS**

- A. Submit in accordance with Section 01 30 00.
- B. Catalog cut sheets for standard items indicating color, finish, materials and method of attachment.
- C. Complete shop drawings (field measured) showing all layout, dimensions, spacing of components, sizes, thickness gauges, finishes, joining, attachments and relationship to adjacent work. Showing plans, elevations, sections, details, fittings, brackets, post foundations (as approved by structural engineer) and attachments to other work, include layout of fences and gates.
- D. Products: complete engineering drawings signed by licensed structural engineer in State of California.
- E. Samples: Two samples of each color for standard manufactured items indicating color and finish. Sample, 8 by 10 inches, minimum size sample of fence panel illustrating design, fabrication workmanship, and selected color coating.
- F. Copy of warranty as specified for review by Architect.

**1.04 REFERENCE STANDARDS**

- A. American Society for Testing and Materials (ASTM) Publications:



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1. ASTM A36 - Structural Steel.
2. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
3. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
5. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
6. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.
7. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
8. ASTM D3363 - Test Method for Film Hardness by Pencil Test.
9. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
10. ASTM D 523 – Standard Test Method for Specular Gloss.
11. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
12. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
13. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test.
14. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test.
15. ASTM G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

**1.05 QUALITY ASSURANCE**

- A. Workmanship and finish in accordance with good practice and the construction documents. Finish work to be firm, in true alignment, and properly squared, with smooth clean uniform appearance, without waves, distortions, holes, cracks, stains or discolorations. Joinings to be close-fitting. Finish work to have no exposed unsightly anchors or fastenings and present no hazardous, unfinished or unsafe protrusions, offsets, burrs, raw edges, or sharp corners. All work to have provisions for expansion and contraction or shrinkage as necessary to prevent cracks, buckling and warping.
- B. Manufacturer's warranty is: 3 years minimum warranty for factory finish against cracking, peeling, and blistering under normal use.
- C. Provide Owner with touch up paint for all fencing; one container for each color installed. Provide all spare parts and extra hardware left over after installation of fencing.
- D. Work of the section to be performed by a firm with five documented examples of comparable work with work of similar scope and quality over the past 5 years and employing personnel possessing these skills and experience.

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1.06 PRODUCT HANDLING

- A. Upon receipt at the job site, all materials to be checked to ensure that no damages occurred during shipping or handling. Materials to be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Fencing materials are as noted on the Drawings and as supplied by manufacturer.
- B. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives.
- C. Hardware is as specified by Architectural Hardware schedule and as stated on the Drawings.
- D. Finishes for Powdercoat steel: or approved equivalent:
  - 1. Primer: Rust inhibitor.
  - 2. Topcoat: Thermosetting polyester powdercoat. UV, chip, and flake resistant.
  - 3. Test Results: "Pangard II".
    - a. Gloss, Garner 60 Degrees, ASTM D 523: Plus or minus 5.
    - b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
    - c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
    - d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
    - e. Erichsen Cupping, ISO 1520: 8 mm.
    - f. Impression Hardness, Buchholz, ISO 2815: 95.
    - g. Impact Test, ASTM D 2794: 60 inches/pound at 2.5 mils.
    - h. Pencil Hardness, ASTM D 3363: 2H minimum.
    - i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.
    - j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.

**PART 3 - EXECUTION**

3.01 INSTALLATION AND FABRICATION

- A. Install all fences in accordance with manufacturer's recommendations.
- B. Prior to fabrication, field verify required dimensions.
- C. Furnish all anchors, bolts, and appurtenances required for complete installation to ensure proper fit and accurate placements.

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D. Place all fences in the proper location, plumb, level, square, in true alignment and firmly anchored. Set gates and jambs true and plumb, then brace to position and secure in place.

E. Do not installed bent, bowed, or otherwise damaged panels. Remove damaged components from site and replace.

F. For Gates:

1. Install per manufacturer's requirements.
2. Secure fence panels with stainless steel anti-intruder bolts to fence posts after posts have been set in footings.
3. Install gates and adjust hardware for smooth operation.
4. After installation, test gate. Open and close a minimum of five times. Correct deficiencies and adjust.
5. Touch-up damaged finish with paint supplied by manufacturer and matching original coating.

### 3.02 REPAIR OF DEFECTS

A. Replace all defective or damaged work. Remove or repair per instructions of the Owner's Representative, at no cost to Owner.

B. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

C. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

### 3.03 CLEAN-UP

A. Upon completion of the work of this Section, and as many times as necessary during the work, remove surplus and waste material, debris, equipment and implements from site and leave the work in a clean, neat acceptable condition.

**END OF SECTION 05 50 10**

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**SECTION 32 31 20**

**DECORATIVE METAL FENCES AND GATES**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Provide decorative steel fence system including manual gate at Trash Enclosure, framing, gate hardware, and accessories as required for complete fence installation as indicated.
  - 1. Excavate for post bases and provide concrete anchorage for freestanding posts, provide sleeves and grout posts embedded in concrete construction.
- B. Related Sections:
  - 1. Section 05 50 10: Miscellaneous metal fabrications.
  - 2. Section 32 31 14: Site Fencing
  - 3. Appendix A: Finish and Materials Schedule.

**1.2 REFERENCES**

- A. American Welding Society (AWS): D1.1, Structural Welding Code.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Design/Build: Provide special engineering to ensure compliance with applicable codes and Contract Documents.
- B. Coordination: Coordinate fence fabrication to allow for secure attachment of wood infill provided by Section 32 31 14: Site Fencing.

**1.4 SUBMITTALS**

- A. Product Data: Submit product literature for gates and operators, gate hardware, grout, and manufactured items.
- B. Shop Drawings: Indicate fence and gate layout, spacing of components, connections, fabrication details, accessories, and anchorage.
  - 1. Indicate profiles, sizes, connections, and anchorage.
  - 2. Provide templates as required for anchor installation by others.
- C. Samples: Submit samples fence section with welds and finish.
- D. Design/Build Certificates: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.

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- E. Sustainability Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification and CALGreen compliance.
  - 1. Environmental Product Documentation: Comply with LEED and CALGreen requirements environmental product declarations, product disclosure, optimization, and other documentation.
  - 2. Coordinate and cooperate with Owner and Architect in providing information necessary for LEED rating certification and ensuring CALGreen compliance.

**1.5 QUALITY ASSURANCE**

- A. Sustainability Requirements: Refer to Section 01 81 13 – Sustainable Design Requirements and Section 01 81 15 - CALGreen Environmental Compliance for LEED points indicated, LEED Certification Goal indicated, and CALGreen.
  - 1. LEED General: Refer to LEED Project Checklist indicating points Design Team has anticipated relating to specific LEED credits and LEED requirements.
  - 2. CALGreen: Refer to CALGreen Project Checklist indicating points Design Team has anticipated relating to specific CALGreen points requirements.
    - a. Comply with requirements including those relative to finish material pollution control for paints and coatings.
- B. Fabricator: Firm with minimum five years successful experience fabricating custom steel fences and gates like those required for Project.
  - 1. Provide fence and gates by same fabricator.
- C. Mock-Up: Provide three panels and posts of Owner and Architect review; approved mock-up may be incorporated into Project when undamaged.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. System Description: Provide decorative steel fence system including gates, manual and automatically operated, framing, and accessories.
- B. Regulatory Requirements: Design fence and gates to support loads as required by California Building Standards Code.
- C. Performance Criteria: In addition to applicable code requirements, design to support minimum lateral force of 50 lbs./lin. ft. uniform load and 200 lbs. at any single point without permanent set or damage; ASTM E935.
- D. Steel Shapes, Plates and Bars: ASTM A36; shapes and sizes as indicated on Drawings; provide weights suitable for specified loads; galvanized.
- E. Structural Steel Sheet: Hot rolled, ASTM A1011; or cold rolled, ASTM A1008, Class 1; of grade required for design loading; galvanized.

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- F. Steel Tubing: Cold formed ASTM A500; or hot rolled, ASTM A501; minimum Grade B; seamless where exposed; galvanized.
- G. Grout: Non-shrink meeting ASTM C1107 non-metallic, pre-mixed, factory-packaged, non-staining, non-corrosive; type specifically recommended by manufacturer as applicable to job condition.
- H. Fasteners and Rough Hardware: Type required for specific usage; provide zinc-coated fasteners.
- I. Welding Materials: AWS D1.1, type required for materials being welded.
- J. Primer: Provide primers as recommended by paint manufacturers for substrates and paints specified in Section 09 90 00 – Painting and Coating.
  - 1. Galvanizing Repair Paint: High zinc-dust content paint for regalvanizing welds in galvanized steel.
- K. Concrete: ASTM C94, normal Portland cement, 2,500 psi at 28 days, 2" to 3" slump, 2 to 4 percent entrained air.

**2.2 FABRICATION**

- A. Framework: Design and fabricate fence to withstand anticipated loads, including loads from people climbing on fence.
  - 1. Configurations: As indicated, welded construction unless otherwise indicated.
  - 2. Fittings: Provide fittings and accessories as required for complete installation.
- B. Fencing and Gate Panel Infill: Wood infill provided in Section 32 31 14: Site Fencing.
- C. Gates: Fabricate gates as indicated, welded construction; comply with ASTM F2200 Standard Specification for Automated Vehicular Gate Construction, Class II – Commercial for types of vehicular gates indicated.
  - 1. Swing Gates: Provide complete with hardware.
    - a. Pivots: Lift-off type, extra heavy-duty ball bearing pivots, sized for anticipated gate loads plus additional live loads of up to 500 lbs per gate leaf, without damage to system.
      - 1) Provide full surface offset pivots to permit 180-degree opening, minimum 1-1/2 pair per gate leaf.
      - 2) Provide set screws to prevent accidental gate removal due to seismic activities or vehicular impact.
      - 3) Weld pivot to gates and frames.
    - b. Cane Bolts: Custom fabrications as indicated.

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- c. Accessories: Keepers, stops, and accessories as required for complete, secure manually operated fence gate installation.
- D. Fabricate items with joints neatly fitted and properly secured.
- E. Grind exposed welds continuous, smooth, and flush with adjacent finished surfaces, and ease exposed edges to approximate 1/32" uniform radius.
- F. Fit and shop assemble in largest practical sections for delivery.
- G. Make exposed joints flush butt type, hairline joints where mechanically fastened.
  - 1. Fabricate joints exposed to weather in manner to exclude water or provide weep holes where water could accumulate.
- H. Supply components required for proper anchorage of custom steel fence; fabricate anchorage and related components of same material and finish as custom steel fence.
- I. Finishing: Galvanize and prime paint custom steel fencing; comply with requirements of Section 09 90 00 – Painting and Coating for preparation and priming.
  - 1. Preparation: Thoroughly clean surfaces of rust, scale, grease, and foreign matter prior to applying finishes.
  - 2. Galvanizing: Provide minimum ASTM A123 or A924 and A653 G90 coating; iron and steel hardware galvanized conforming to ASTM A153.
  - 3. Priming: Comply with requirements in Section 09 90 00 – Painting and Coating; do not shop prime surface areas requiring field welding; shop prime in one coat.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication.

**3.2 INSTALLATION**

- A. Install fence, gates, and accessories to provide rigid structure for configurations indicated as specified and in accordance with applicable code requirements.
- B. Install line, corner, and terminal posts plumb in locations indicated on Drawings.
  - 1. Coordinate embedded post sleeves with concrete work.
  - 2. Grout posts solid when indicated on Drawings.
- C. Install gates for free, easy operation.
  - 1. Test gate operation and adjust as necessary to require not more than 5-lbs pressure to operate gate and hardware.

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- D. Obtain Architect's review prior to site cutting or making adjustments that are not part of scheduled work.
- E. Install components square and level, accurately fitted and free from distortion or defects detrimental to appearance or performance.
  - 1. Supply items required to be cast into or embedded in other materials to appropriate trades.
  - 2. Ensure alignment with adjacent construction; coordinate with related work to ensure no interruption in installation.
- F. Make provision for erection stresses by temporary bracing; keep work in alignment.
- G. Field bolt and weld to match standard of shop bolting and welding; hide bolts and screws whenever possible, where not hidden, use flush countersunk fastenings.
  - 1. Perform field welding in accordance with AWS D1.1.
  - 2. Bolting permitted for slide fence hardware only.
- H. After installation, touch-up field welds and scratched and damaged surfaces; use same primer as used for shop coat.
- I. Replace items damaged in course of installation and construction.

**END OF SECTION**



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**SECTION 32 84 00**

**IRRIGATION**

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**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Provisions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Work Included: Install irrigation system complete as shown and as specified.

1.03 QUALITY ASSURANCE:

- A. Permits and Fees: Obtain and pay for all permits required.
- B. Manufacturer's Specifications: Follow Manufacturer's current printed specifications and drawings in all cases where the manufacturers of articles used in the Contract furnish directions covering points not specified or shown in the Drawings.
- C. Ordinances and Regulations: Local, municipal, and state laws, codes, and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications is not to be construed to conflict with any of the above codes, regulations, or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above codes and regulations, the provisions of these Specifications and Drawings are to take precedence.
- D. Due to the scale of the Drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. Carefully investigate the conditions affecting all of the work and plan accordingly and furnish all required fittings. Install system in such a manner to avoid conflicts with planting, utilities, and architectural features.
- E. Do not install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in are dimensions exist that might not have been considered in engineering. Bring such obstructions or differences to the attention of the Landscape Architect. In the event this notification is not given, the Contractor assumes full responsibility for any revision necessary.

1.04 SUBMITTALS

- A. Materials List:

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1. Within ten (10) days after the award of the Contract, submit an electronic copy of the complete lists of materials proposed for installation, and obtain the Landscape Architect's written approval thereof before proceeding. Use only accepted materials and items of equipment.
2. List all materials by manufacturer's name and model number.

**B. Manuals:**

1. Prior to the final acceptance of the irrigation system, furnish three (3) individually bound Service Manuals to the Landscape Architect for use by the Owner. The manuals are to contain complete enlarged drawings, diagrams and spare parts lists of all equipment installed showing manufacturer's name and address. In addition, each Service Manual is to contain the following:
  - a. Index sheet indicating the Contractor's name, address, and phone number.
  - b. Copies of equipment warranties and certificates.
  - c. List of equipment with names, addresses and telephone numbers of all local manufacturer's representatives.
  - d. Complete operating and maintenance instructions in sufficient detail to permit operating personnel to understand, operate and maintain all equipment.

**C. Record Drawings:**

1. Dimension from two (2) permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following items:
  - a. Connection to existing water lines.
  - b. Gate valves.
  - c. Routing of pressure (main) lines.
  - d. Remote control valves.
  - e. Routing of control wiring.
  - f. Other related equipment as directed by Landscape Architect.
  - g. All sleeve locations.

- D. Deliver a reproducible Record Drawing to the Landscape Architect within seven (7) working days before the date of Final Inspection. Delivery of the record drawings does not relieve the Contractor of the responsibility of furnishing required information in the future.**

**E. Controller Plan:**

1. Create a 'bubble diagram' controller plan. At a minimum, the plan must show the area controlled by each valve and any major permanent structure, such as buildings and roads.
2. These charts to be waterproof and submitted to the Landscape Architect at the coverage test of the irrigation system.

- F. Maintenance Material - Supply the following tools to the Owner:**

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1. Two (2) quick-coupler keys and matching hose swivels for each type of quick coupling valve installed.

**1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Furnish and deliver materials in manufacturer's packaging, bearing and original legible labeling.
- B. Handle and store all equipment in accordance with manufacturer's current printed specifications.

**1.06 SEQUENCING AND SCHEDULING**

- A. Coordination: Coordinate with the work of other sections to insure the following sequence of events.
  1. Sleeves and Conduits: Installation of all sleeves and conduits to be located under paving and through walls prior to placement of those materials.
  2. Build out of irrigation system.

**1.07 WARRANTY FOR IRRIGATION SYSTEM IS ONE (1) YEAR.**

- A. Provide a Warranty for the irrigation system in accordance with the attached warranty form, and file with the Owner or his representative prior to acceptance of the irrigation system.
- B. Include a copy of the warranty form in the Operations and Maintenance Manual.
- C. Retype the warranty form onto the Contractor's letterhead and contain the following information:

**WARRANTY FOR IRRIGATION SYSTEM**

We hereby warrant that the irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the Drawings and Specifications, ordinary wear and tear and unusual abuse, or neglect expected. We agree to repair or replace all defects in material or workmanship which may develop during the period of one (1) year from date of acceptance and also to repair or replace any damage resulting from the repairing of such defects at no additional cost to the Owner. We will make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT:

LOCATION:

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CONTRACTOR:

Company / License #

ADDRESS:

PHONE: (     )     

DATE OF FINAL ACCEPTANCE:

Name

Signed / Date

**1.08 MAINTENANCE**

- A. Maintain irrigation system during the duration of the maintenance period. Adjust and correct system as required.
- B. Routine: Inspect and adjust all control valves. Verify correct operating pressure.
- C. Controller: Program for predicted weather for 30 days following final inspection, then switch controller to soil sensor mode.
- D. Instruct designated city personnel in programming and operation of the battery-powered controller, including connection to Bluetooth enabled devices and programming via the app available from Hunter Industries.
- E. Drip Irrigation: Inspect and flush filters. Flush lines as required. Inspect emitters for proper flow, and check moisture level at plant rootball weekly for the first month of operation and monthly thereafter.
- F. System Failure: Perform all repairs within one (1) operating period. Replacements to match removed products and materials in all respects. Report promptly all damage not resulting from Contractor's operations. Repair all damage caused by Contractor at no expense to Owner.
- G. Climate Change: Do not run the irrigation system during the rainy season. Set and program automatic controllers in response to seasonal requirements and requirements of newly - planted materials.

**PART 2 - PRODUCTS**

**2.01 GENERAL**

- A. Use only new materials of brands and types noted on Drawings or substitutes accepted by Landscape Architect.

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**2.02 IRRIGATION COMPONENTS**

- A. Gate valve, quick coupling valve, remote control valve, drip irrigation equipment: As Shown on Drawings.

**2.03 PIPES**

- A. Pressure Main Line Pipe and Fittings: All PVC fittings are to bear the manufacturer's trademark name, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
  - 1. PVC scheduled pipe: Schedule 40 ASTM D1785 NSF approved Type I Grade I, PVC and Federal Specification PS-21-70.
- B. PVC Non-Pressure Lateral Line Piping and Sleeving:
  - 1. PVC scheduled pipe: Schedule 40 ASTM D1785 NSF approved Type I Grade I, PVC and Federal Specification PS-21-70.
  - 2. PVC solvent - weld fittings: ASTM D2466 Schedule 40, 1-2, II-I NSF approved.
  - 3. Copper: ASTM B-42-84 Type K.

**2.04 CONTROL WIRES**

- A. Type: Copper with UL approval for electrical conduit, size 14-1. Common ground wire with white insulating jacket; individual control wires with insulating jacket of color other than white.

A-B. Splice kits: complete waterproof kits; 3M DBY or equivalent.

**2.05 VALVE BOXES**

- A. Commercial grade, fiberglass reinforced plastic; NDS Pro Series, Carson, or equivalent. Color black. Furnish with lid locking bolt
- B. Size for subsurface control valve assemblies, 13"x22" 'jumbo'; for gate valves, 10" round; for automatic flush valves, 6" round.

**2.06 MISCELLANEOUS INSTALLATION MATERIALS:**

- A. Solvent cement and primers for solvent weld joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement proper consistency throughout use.
- B. Pipe joint compound: Do not use on sprinkler inlet port.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Verify that all installed sleeving and conduits are undisturbed and are free of defects or errors introduced by the work of other sections.

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- B. Controller: Inspect and verify acceptability of location designated to receive relocated automatic controller.
- C. Notification: Submit written notification to Landscape Architect within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

**3.02 INSTALLATION**

**A. Conduits and Sleeves:**

- 1. Coordination:
  - a. Sleeving will be existing only when installed under another subcontract. Inspect as specified above.
- 2. Extent: Conduit required for all low voltage control wiring, from controller to all control valves boxes.

**B. Excavating and Trenching:**

- 1. Existing Installations: Restore to their original conditions, damaged surfaces and underground installations as a result of the excavations at no cost to Owner.
- 2. Trenches: Dig trenches wide enough to allow a minimum of 6 in. between parallel pipe lines. Provide a minimum cover from finish grade as follows:
  - a. 18 in. Deep: Over pipe on pressure side of irrigation control valve.
  - b. 12 in. Deep: Over pipe on non-pressure side of irrigation control valve.

**C. Pipe Line Assembly:**

- 1. Pipes
  - a. Install pipes and fittings in accordance with manufacturer's current printed Specifications.
  - b. Clean all pipes and fittings of dirt, scales and moisture before assembly.
- 2. Solvent-Welded Joints for PVC Pipes:
  - a. Solvents: Use solvents and methods specified by pipe manufacturer.
  - b. Curing Period: Minimum of 1 hour before applying any external stress on the piping and at least 24 hours before placing the joint under water pressure.
- 3. Threaded Joints for Plastic Pipes:
  - a. Tape: Use Teflon tape on threaded PVC fittings.
  - b. Joining: Use strap-type friction wrench only. Do not use metal-jawed wrench.
- 4. Laying of Pipe:
  - a. Bedding On-grade: Bed pipes in at least 2 in. of soil. Backfill on all sides of piping to provide a uniform bearing.

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- b. Snaking: Snake pipe from side to side of trench bottom to allow for expansion and contraction. Minimum allowance for snaking is one (1) additional ft. per 100 ft. of pipe.
- c. Moisture Restrictions: Do not lay PVC pipe when there is water in the trench. Do not assemble PVC pipe unless the pipe is perfectly dry.

D. Control Valves:

- 1. Install valves where shown on Drawings. Stake proposed locations of all valves and obtain approval of Owner's Representative prior to installation.
- 2. Attach valve tag to solenoid lead wire, Christy standard tag.
- 3. Install locking bolt kit in all valve box lids.

E. Point source drip Irrigation:

- 1. Install each emitter on its own flexible PVC riser.
- 2. Stake emitters to tops of plant rootballs using standard steel drip line staples.
- 3. Cover emitters with mulch to be out of sight.

F. Automatic Controller:

- 1. Existing controller is to be relocated.
- 2. General: Install per manufacturer's current printed Specifications.
- 3. Connection to Valves: Valve sequence shown on plan is for reference only. Sequence valves as directed by owner's representative.

G. Control Wiring:

- 1. General: Install control wires along irrigation main wherever possible.
- 2. Extra Length: Provide 24 in. extra control wire at each within each valve box. Coil extra control wire.

H. Closing of Pipe and Flushing of Lines:

- 1. Capping: Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- 2. Flushing: Thoroughly flush out all water lines before installing drip emitters.

3.03 FIELD QUALITY CONTROL

A. Adjustment of the System: Adjust flow control of all remote control valves for correct operation. Control valves should close within 5 seconds of deactivation by controller.

B. Testing of Irrigation System:

- 1. In the presence of the Landscape Architect test all pressure lines (mains and laterals) under hydrostatic pressure of 125 pounds per square inch, and prove watertight.
- 2. Sustain pressure in lines for not less than two (2) hours. If leaks develop, repair and repeat test until entire system passes.

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3. When the landscape irrigation system is completed, perform a coverage test in the presence of the Landscape Architect, to determine if the water coverage for planting areas is adequate.
4. Test controllers individually in the presence of the Owner's Representative and the Landscape Architect. Demonstrate that all control valves operate electrically.
5. Demonstrate to Landscape Architect that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

**3.04 BACKFILL AND COMPACTING**

- A. General: After system is operating and required tests and reviews have been made, backfill excavations and trenches with clean soil, free of debris.
- B. Backfill For All Trenches: Regardless of the type of pipe covered, compact to minimum 95 percent density under pavements, and 85 percent under planted areas.
- C. Compacting: Compact trenches in areas to be planted by thoroughly flooding the backfill. Jetting process may be used in those areas.
- D. Finishing: Dress off all areas to finish grades.

**3.05 MAINTENANCE:**

- A. The entire irrigation system is to be under full automatic operation for a period of two (2) days prior to any planting.
- B. The Landscape Architect reserves the right to waive or shorten the operation period.

**3.06 CLEAN-UP**

- A. Clean-up as each portion of work progresses. Remove refuse and excess dirt from the site. Paving is to be broomed or washed down. Repair damages incurred on the work of others and restore to original conditions.

**3.07 FINAL REVIEW**

- A. Operate each system in its entirety for the owner at time of final review. Any items deemed not acceptable by the owner must be reworked to the complete satisfaction of the owner.
- B. Notify the Landscape Architect in advance for the following reviews, according to the time indicated:
  1. Pre-construction conference - 7 days.
  2. Supply line pressure test and control wire installation - 72 hours.
  3. Coverage and controller test - 72 hours.
  4. Final review - 7 days.



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- C. No reviews will commence without record drawings. In the event the Contractor calls for a review without record drawings, without completing previously noted corrections, or without preparing the system for review, he will be responsible for reimbursing the Landscape Architect at the rate of two and one-half times the normal office hourly rate per hour portal to portal (plus transportation costs) for the inconvenience. No further reviews will be scheduled until this charge has been paid.

**END OF SECTION**

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**SECTION 32 90 00**

**PLANTING**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Furnish all labor, materials, tools and equipment necessary for planting as indicated on the plans and as specified herein; including components and accessories required for a complete installation, including but not limited to the following components:
  - 1. site preparation
  - 2. soils reports
  - 3. soil preparation
  - 4. soil amendments
  - 5. mulch
  - 6. planting
  - 7. fertilizing
  - 8. edging
  - 9. project completion
  - 10. and the provisions for the maintenance and warranty periods.

**1.02 RELATED SECTIONS**

- A. Earthwork: Section 31 00 00
- B. Planting Irrigation: Section 32 84 00

**1.03 REFERENCES**

- A. Model Bay-Friendly Landscape Maintenance Specifications: serves as a reference document to provide language as needed to improve the environmental standards of ongoing landscape maintenance contracts.
- B. Bay-Friendly Landscape Guidelines: fully describes the seven Bay-Friendly principles, offering 55 practices in sustainable landscape design, construction, and maintenance.
- C. Additional Bay-Friendly resources found at [www.RescapeCalifornia.org](http://www.RescapeCalifornia.org)

**1.04 SUBMITTALS**

- A. Submit samples for import topsoil if required, soil amendment, existing site soil, lawn seed, decomposed granite and mulch, approximately 2 cups volume each, 30 days prior to commencement of work. Appropriately sized samples to be submitted to allow for verification lab analysis to be completed.
  - 1. Place a permanent label on each sample which identifies the product.
- B. Soil and Soil Amendment Reports

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1. Submit soil reports for existing soil and import topsoil if required, 30 days prior to commencement of work.
  2. Submit another soils report after recommended soil amendments have been incorporated during soils preparation work.
  3. Compost analytical data to be submitted and not older than 90-days.
- C. Document with receipts or invoices that all plants have been located and secured for the work by ordering, paying deposits, or as required. Provide name and location of nursery, contact person, and telephone number.
- D. Notice of Shipment: At time of delivery, submit notice from nursery containing the following: Name and location of shipper; date of shipment; name of commodity; quantity; certificate that material complies with the specifications; size; statement of root pruning, including dates; and statement that plants are acclimated and have been growing outside.
- E. Submit certificates of conformance and supplier's receipt for all materials specified including compost amendment, mulch, import topsoil, lawn seed, and sod. Furnish a certificate with each delivery to the site of material in containers, or in bulk. Certificate to state source, quantity or weight, type and analysis, and date of delivery. Deliver all certificates to Owner's Representative.
- F. Submit typed recommended procedures to be established by Owner for maintenance of planting for one full year. Submit prior to expiration of required maintenance period.

1.05 QUALITY ASSURANCE

- A. Licensing requirements: Possess a State of California Landscape Contractor license and meet the State of California licensing requirements for the application of herbicide.
- B. Maintain and protect materials and plants stored on the job site from vandalism, theft, and damage. Protect plants from desiccation and damage.
- C. Specified plants to conform to approved names in "A Checklist of Woody Ornamental Plants of California" Manual 32. Plants conforming to the standards outlined by the Association of Nurserymen, "American Standard for Nursery Stock, " ANSI Z60.1-2004."
- D. Supply plants grown under climatic conditions similar to those at the project site.
- E. Use Redwood conforming to "Standard Specification for Grades of California Redwood Lumber" of the Redwood Inspection Service.
- F. Pruning per "Pruning Standards" of the Western Chapter of International Society of Arboriculture and ANSI A300 Pruning Standards.

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1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent damage by moisture or exposure.
- B. Cover plants transported on open vehicles with a protective covering to prevent wind burn.
- C. Deliver and install sod within a period of 36 hours.

1.07 PROJECT CONDITIONS

- A. Work notification: Notify Owner's Representative at least 3 working days prior to installation of plants.
- B. Protect existing utilities, paving, and other facilities from damage caused by landscape operations.
- C. Locate, protect, and maintain the irrigation system during planting operations. Repair irrigation system components damaged during planting operations.

1.08 WARRANTY

- A. All trees to be warranted for 1 year after Final Acceptance. All other plants are to be warranted for 90 days after Final Acceptance. Provide new plants for plants that have died or indicate poor health during this time, at no additional cost to Owner or Owner's Representative. Provide replacement plants within two weeks of notification by Owner's Representative.
- B. Warranty will not cover damage or loss of plants caused by fires, floods, freezing rains, lightning storms, winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of the site.

1.09 DEFINITIONS

- A. The "Owner's Representative" is the person, appointed by the Owner, to represent their interests. The Owner's Representative will be on site frequently and regularly during construction. Where needed, the Owner's Representative will identify the need for field visits by the Owner's Representative or other consultants.
- B. "BFL" and "Bay-Friendly" refer to the Bay-Friendly Landscape guidelines, rating system, scorecards and conformance requirements as described and documented by ReScape California
- C. "Integrated Pest Management" (IPM) is a holistic approach to mitigating insects, plant diseases, weeds, and other pests. It involves the use of many strategies for managing, but not eliminating pests. IPM uses cultural, mechanical, physical, and biological control methods before using pesticides to control pests and diseases in the landscape. Chemical controls are applied only when monitoring indicates that preventative and non-chemical methods are not keeping pests below acceptable

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levels. When pesticides are required, the least toxic and the least persistent pesticide that will provide adequate pest control is applied.

- D. The “Organic Materials Review Institute” (OMRI) is a national nonprofit organization founded in 1997 to support the organic community. OMRI reviews products to determine their suitability for producing, processing and handling organic food and fiber under the USDA National Organic Program Rule, OMRI General Materials List.
- E. California Dept. of Food & Agriculture’s Organic Input Materials Program (CDFA) and their Organic Input Material database (OIM) provide certification for Organic materials.
- F. US Composting Council Seal of Testing Assurance (STA): certifies compost has been appropriately manufactured.
- G. “Sheet Mulching” or “Cardboard Mulching” refers to a practice whereby a layer of paper or cardboard is used underneath the mulch to enhance weed suppression and soil building benefits.

**PART 2 - PRODUCTS**

**2.01 PLANTS**

- A. Supply well-shaped, vigorous plants that are typical of the species. Provide plants free of defects, disfiguring knots, abrasions, sunscald injuries, insect eggs, borers, and all forms of insect infestation. Remove plants that do not conform to these requirements, as determined by Owner's Representative.
- B. Container Stock: Plants to be well-established in containers, having been grown in the container for not less than 6 months, nor longer than 2 years. The Owner's Representative reserves the right to inspect root conditions of plants in containers and to reject those which are not well-rooted or show evidence of being root-bound; remove rejected plants from the site.
- C. Trees to have a symmetrical form as typical for the species/cultivar and growth form with a single, relatively straight central leader and tapered trunk. Main branches well-spaced and no larger than two-thirds the diameter of the trunk, measured one inch above the branch.
- D. Tree trunk diameter and taper sufficient that the tree will remain vertical without the support of a stake. Trunks free of wounds. Trunk diameter six inches above rootball within the diameter range shown below:
  - 5 gallon size container 0.5 inch to 0.75 inch
  - 15 gallon size container .75 inch to 1.5 inches
  - 24-inch box 1.5 inches to 2.5 inches
  - 36-inch box 2 inches to 3 inches
- E. Trees well-rooted in the soil mix. Rootball periphery free of large circling and bottom-matted roots. Trunk, root collar and large roots free of circling and / or kinked roots

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- F. All plants legibly tagged by species and variety with a minimum of 1 tag per 10 trees, 10 shrubs, and 100 ground covers.
- G. Flat-grown plants well-rooted, full, and compact; not "leggy."
- H. Lawn:
  - 1. Bolero 90% Dwarf Fescue/10% Bluegrass sod as available from Delta Bluegrass Company, telephone: 1.800.637.8873, web site: www.deltabluegrass.com.
  - 2. Thickness of Cut: Machine cut sod at a uniform soil thickness of 1", plus or minus 5/8 inch. Exclude top growth and thatch in measurement for thickness.
  - 3. Pad Size: Cut sod to 18" width and 80" length. Broken pads and torn or uneven ends will not be acceptable. Provide sod with a minimum of 1" soil adherence.
  - 4. Strength of Sod Sections: Standard size sections strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10% of the section. Use only sod without netting of any sort.
  - 5. Moisture Content: Do not harvest or transport sod when moisture content, excessively dry or wet; it may adversely affect its survival.
  - 6. Age: Not less than 10 months or more than 30 months old.
  - 7. Mowing Heights: Before harvesting, mow sod uniformly at a height of 1 inch.
  - 8. Diseases, Nematodes, and Insects: Provide sod free of diseases, nematodes, and soil-borne insects.
  - 9. Weeds: Provide sod free of objectionable grassy and broad leaf weeds. Sod is considered free of such weeds if less than 1 such plants are found per 100 sf of area.

**2.02 SOIL FERTILITY TEST AND REPORT**

- A. Submitted soil report must include the following: soil fertility, agricultural suitability, particle size appraisal, pH, salinity, nitrate, ammonium, phosphate, potassium, calcium, magnesium, boron, sodium adsorption ratio, organic content, moisture infiltration rate, USDA particle size (textural analysis) and testing lab's recommendations for amending.
- B. Soil tests for existing soil and import soil to be performed by Waypoint Analytical, Inc., P.O. Box 153, Santa Clara, CA 95052, tel (408) 727-0330, request test No. A-05; Perry Laboratory, 471 Airport Blvd., Watsonville, CA 95076-2026, tel. (831) 722-7606; Environmental Technical Services, 1343 Redwood Way, Petaluma, CA 94954-6544, (707) 795-9605; Root Zone Associates, tel. (408) 264-7024, or other soil testing service as approved by Owner's Representative. Request test and recommendations for "organic" approach to soil and landscape management. For Soil and Plant Labs this includes the following tests: A17, Complete fertility package; A09, Non-composted amendments; and A91, Compost evaluation.
- C. Perform 3 tests of existing site soil, at different locations, to ensure that variations in soil conditions are tested.
- D. Amount and type of amendment or OMRI fertilizer identified in the Soils report takes precedence over these specifications. For bidding purposes see PART 3 – Soil Preparation.

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- E. Recommendations from Soil Testing Lab to provide recommendations for soil amendments.

**2.03 OMRI FERTILIZERS**

- A. Topdress with compost per soils test. Compost is considered the soil fertilizer, if soil testing recommends fertilizer in addition to compost, OMRI fertilizers are to be used as stated below.
- B. For Lawns: OMRI Bio-Turf (8-3-5) manufactured by Down To Earth, resold by Planet Naturals, <https://www.planetnatural.com>
- C. For General Plant Beds: OMRI Bio-Live (5-4-2) manufactured by Down To Earth, resold by Planet Naturals, <https://www.planetnatural.com>
- D. Or acceptable equivalent as recommended by soil testing laboratory performed test that is OMRI listed, or California Dept. of Food & Agriculture’s Organic Input Materials Program (CDFA) Organic Input Material (OIM) listed or listed by the US Department of Agriculture’s National Organic Program.
- E. Soil amendments materials prohibited by OMRI in its generic materials list are prohibited in the construction of the project.

**2.04 SOIL AMENDMENT/ COMPOST**

- A. OMRI Compost, acceptable products include:
  1. Recology Premium Compost, made from 100% recycled yard debris, municipal green material and food scraps, screened to about ¼" and has the US Composting Council's Seal of Testing Assurance. from Recology Organics, telephone: 866-764-5765, as supplied by Blossom Valley Organics, web site: <http://thecompoststore.com/>
  2. "WonderGrow Organic Compost" available from Recology Grover Environmental Products, Vernalis, CA, (866) 764-5765; "Super-Humus Compost" available from Republic Services, Milpitas, CA, (408) 945-2836;
  3. Organic Compost screened 3/8" minus by Z-Best products, [www.zankerrecycling.com](http://www.zankerrecycling.com),
  4. or approved equivalent.
- B. OMRI compost made from green and food waste, local is preferred. Compost from sewage waste is not allowed. Source of compost from a producer that has the US Composting Council's Seal of Testing Assurance.
- C. Submit a sample and analysis (Compost Technical Data Sheet) by soil testing lab to the Design Team for approval prior to delivery.
- D. Organic compost conforming to the following specification guidelines.

PROPERTY	TEST METHOD	REQUIREMENT
pH	TMECC 04.11-A	6-8.5

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Soluble salts	TMECC 04.10-A Electrical conductivity 1:5 slurry method	0-5 or 10	
Moisture content	TMECC 03.09-A Total solids & moisture at 70 + 5° C % wet weight basis	30-60 or 35-55	
Organic matter content	TMECC 05.07-A Loss-on ignition organic matter method (LOI) % dry weight basis	30-60	
Maturity	TMECC 05.05-A Germination and vigor % relative to positive control		
	Seed emergence	80 or above	
	Seedling vigor	80 or above	
Stability	TMECC 05.08-B Carbon Dioxide evolution rate mg CO <sub>2</sub> -C/g OM per day	4 or below	
Pathogen	TMECC 07.01-B Salmonella <3 MPN per gram, dry weight basis	Pass	
Pathogen	TMECC 07.01-B Fecal coliform bacteria <1,000 MPN per gram, dry weight basis	Pass	
Physical contaminants	TMECC 02.02-C Man-made inert removal and classification: Plastic, glass, and metal % 4mm fraction	Combined total: <0.5%	
Physical contaminants	TMECC 02.02-C Man-made inert removal and classification: Sharps (sewing needles, straight pins and hypodermic needles) % >4mm fraction	None detected	
<b>PARTICLE SIZING FOR PARTICULAR PRODUCTS</b>			
Fine Compost (for soil incorporation)	TMECC 02.02-B Sample sieving for aggregate size classification % dry weight basis	Min	Max



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	Pass 2-inch sieve	98%	=
	Pass 3/8-inch sieve	95%	=
	Pass 3/8-inch sieve (minimum 70% retained)	=	30%
	Maximum particle length: 6-inches		

\*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC)

- E. Soil amendments materials prohibited by OMRI in its generic materials list are prohibited in the construction of the project.

**2.05 TOPSOIL**

- A. Existing on-site surface soil or imported topsoil as specified herein. Provide import topsoil only when quantity or quality of existing on-site topsoil is inadequate to complete the work.
- B. Fertile, friable, natural soil, capable of sustaining healthy plant life. Free of stones and other objects over 2 inches in diameter, including subsoil and clay lumps. Without weeds, roots, noxious seeds, toxic substances, trash and other deleterious substances. Not infested with plant-parasitic nematodes or with other noxious animal life.
- C. Soil Fertility: Topsoil to contain sufficient quantities of organic matter and available nitrogen, phosphorus, potassium, calcium, and magnesium to support normal plant growth, as determined by soil testing and analysis specified herein. In the event of nutrient inadequacies, incorporate required materials prior to planting.
- D. Soil Chemistry: Meet the following standards:
  - 1. Salinity: Saturation extract conductivity less than 3.0 mmhos/cm at 25 degrees C.
  - 2. Sodium: Sodium adsorption ratio less than 6.0.
  - 3. Boron: Saturation extract concentration less than 1.0 ppm.
  - 4. pH: pH of saturated paste 5.5 to 7.5.
- E. Infiltration Rate: Meet required rate where indicated.
- F. Imported Topsoil: Meet all requirements specified herein for Topsoil. In addition, meet the following:

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1. Obtained from well-drained, arable land. Not taken from areas on which are growing any noxious weeds such as, but not limited to, Morning Glory, Sorrel or Bermuda grass.
  2. "Sandy Loam" as classified in accordance with USDA Standards. Soil must pass through a 2.0-mm sieve. Sand fraction with 85 percent falling in the medium to fine sand range. Silt and clay content not exceeding that of the existing soil over which the import topsoil is to be placed.
- G. Identify the source of topsoil, for observation and approval by the Owner's Representative prior to any hauling or placing of soil. In addition, submit soil sample and soil analysis report as specified herein.

## 2.06 MULCH

- A. Mulch is a 3" layer of Green Waste Mulch
- B. Green Waste Mulch: wood waste from tree trimming, not containing eucalyptus; 100% recycled material, composted to reduce weed seeds, with no color additive; double-ground; the largest allowable pieces not larger than 2" in any direction. Acceptable products include:
1. Arbor Mulch from American Soil and Stone, Richmond, CA 94804, 510-292-3000, website: <https://www.americansoil.com/>
  2. Arbor Mulch from Grab 'n' Grow Soil Products, Santa Rosa, CA, 707-575-7275;
  3. GWRY Treeincarnation Premium Landscape Mulch, all-wood, screened 3-inch minus, from Green Waste Recycle Yard, Richmond, CA, 510-527-8733;
  4. Arbor Mulch, 1inch to 1.5 inches in size, from Recology Organics, telephone: 866-764-5765, web site: <http://thecompoststore.com/>
  5. Premium Arbor Mulch, from Lyngso Garden Materials, telephone: 650-364-1730, web site: <http://www.lyngsogarden.com/>
  6. or approved equivalent.

## 2.07 CARDBOARD

- A. Cardboard mulch: 2 layers of 100% recycled B flute cardboard as a biodegradable weed barrier to cover entire planting area, excluding lawn areas.

## 2.08 HERBICIDES

- A. OMRI Herbicides:
1. Pre-emergent: See Section 2.07 CARDBOARD SHEET MULCH.
  2. If contractor feels cardboard is not enough for weed control, OMRI herbicides can be used in addition to the cardboard such as: 100% organic, Corn Gluten Meal Weed Suppressant "Bio-Weed" available from Bioscape Inc, Petaluma, CA, 1-877-246-7227, "Weedban" corn gluten meal by Fertrell Company, [www.fertrell.com](http://www.fertrell.com) (717) 367-1566, or acceptable OMRI equivalent.
  3. Post-emergent type: "Scythe" natural herbicide by Mycogen Corporation, San Diego, CA, (800) 745-7476, "Weed Zap" available from JH Biotech, [www.jhbiotech.com](http://www.jhbiotech.com) (800) 650-8933, or acceptable OMRI equivalent.

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**2.09 STAKES & TIES**

- A. Tree Stakes: Lodgepole pine, 2-inch outside diameter with tapered driving point and chamfered top; untreated; length as required to provide minimum support needed while allowing for maximum flexibility, as manufactured by C&E Lumber Company, Pomona, CA (909) 626-3591 or acceptable equivalent.
- B. Tree Stakes: Schedule 40 metal with auger-type foot; 9-foot-long, 3/4-inch diameter stake, color-black, with adjustable 12-inch rigid arm and anti-rotational pin; as manufactured by Reddy Stake, Turlock, CA (888) 333-3090 or acceptable equivalent. Stakes to be re-useable for future plantings.
- C. Tree Stakes: 1-1/2 inch diameter galvanized pipe, painted with two coats flat black paint, length as shown on plans.
- D. Stakes for Anchoring: 2" x 2" x 3-4 foot length untreated wooden stakes.
- E. Auxiliary Stakes: 1/8-inch-diameter spring-steel wire, fiberglass rod, or bamboo. Wrap ends of stakes with friction tape to avoid injury to the trunk.
- F. Ties for vines: Green vinyl tape, minimum 2 ties per vine.
- G. Ties made of webbed material, 1 1/2-inch-wide flat woven polypropylene w/900-lb breaking strength; specifically designed for securing trees to staking materials, "Arbortie" by Deep Root Partners, LP (800) 458-7668, color: olive green; or acceptable equivalent.

**2.10 SUBSTITUTIONS**

- A. Substitutions must have written approval of Owner's Representative and equal the standard of products specified in the Construction Documents.
- B. Installation of approved substitution is Contractor's responsibility. Changes required for installation of approved substitution must be made to the satisfaction of Owner's Representative and without additional cost to the Owner.
- C. Approval by Owner's Representative of substituted equipment does not waive these requirements.
- D. Plant substitution will not be permitted unless written evidence is provided from at least three nurseries that the plants specified are not obtainable.

**PART 3 - EXECUTION**

**3.01 OBSERVATIONS/MEETINGS**

- A. Notify Owner's Representative at least 3 days prior to scheduling an observation meeting. Contractor to be present at observation meetings.
- B. Call for an observation meeting at the following stages of work:

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1. After the finish grading is complete and plants have been delivered and spotted.
  2. At the completion of all work.
- C. Perform remedial work directed by the Owner's Representative within 10 days after the observation meeting. Complete remedial work in accordance with the Contract Documents and at no additional cost to the Owner.

**3.02 GRASS/WEED ERADICATION**

- A. Achieve 100% eradication of existing grass/weeds, including foliage and roots.
- B. Coordinate scheduling of Non-organic herbicide application with other work and follow herbicide manufacturer's directions to achieve maximum effectiveness.
1. Thoroughly apply herbicide to all existing grass/weeds per manufacturer's recommendation prior to commencement of planting operations. After a few days make a second application. Do not remove dead vegetative material.
  2. Continue to re-apply herbicide until 100% eradication is achieved.
  3. After 100% eradication is achieved, notify Owner's Representative for a site observation. Do not proceed with clearing until after receiving a written directive to proceed from the Owner's Representative.
  4. If clearing operation is begun prior to receiving written approval from Owner's Representative, planting must be delayed a minimum of 30 calendar days to be certain that re-growth does not occur. Contractor to pay all costs resulting from such delay.

**3.03 SOIL PREPARATION**

- A. Finish Grades:
1. Rough grade the general planting site area to plus or minus 0.10 foot. Rough grading at lawn and planting areas to be 4 inches below finish grade of adjacent paving and planter rim elevations. Finish grades in planting areas to be set flush, or 1 inch below, adjacent surfaces unless otherwise noted.
  2. Actual rough grade elevations, and soil amendment depths to be determined by amount of amendment required by the Soil Report, per section 2.02, and the depth of mulch specified in the planting details. Verify the required soil and mulch depth and the grading parameters with the Owner's Representative prior to starting the work.
  3. If sheet mulching with cardboard mulch is installed set finish grade of planting areas at a depth down to accommodate the thickness of the mulch.
- B. Weed and Debris Removal: Clean all ground areas to be planted of all weeds and debris prior to beginning soil preparation or grading work. Remove weeds and grasses with the roots. Apply OMRI post-emergent herbicide if needed. OR Sheet mulch the lawn in place.
- C. IPM to be used for control of weeds. Pre-emergent herbicides are to not be used as a first and only weed control method. Per BFL D.8.a, do not use pesticides that are not allowed by the OMRI in its generic materials for the maintenance of the landscape. Contractor to submit an IPM holistic approach to mitigate weeds and plant diseases.

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- D. Construction Debris and Contaminated Soil:
1. Do not perform soil preparation work in areas where soil contains deleterious materials such as construction debris. Bring such areas to the attention of the Owner's Representative and do not proceed with the work until the soil debris is properly removed from the site.
  2. If contaminants or other hazardous materials are discovered in the soil, stop work and notify the Owner's Representative immediately. Do not proceed with the work until direction has been provided by the Owner's Representative.
- E. Moisture Content: Do not work soil when moisture content is so great that compaction will occur, nor when it is so dry that dust will form, or when soil clods will not break readily. Apply water if necessary to bring soil to an optimum moisture content to complete the specified work.
- F. Take extreme care to avoid damage to plants indicated on plans to be saved. Do not disturb soil within the canopy of plants to be saved.
- G. Site and Soil Preparation For Landscape Areas excluding Biofiltration Areas:
1. Cross-rip the subgrade to 8" or 12" depth (pick one) unless noted otherwise on drawings. (NOTE: 2015 WELO REQUIRES COMPOST BE INCORPORATED TO DEPT OF 6 INCHES MINIMUM. Ripping to be continued until the entire specified depth is loose and friable. City and Owner's Representative to review and verify that ripping is complete. Water to be applied as necessary to bring soil to optimum moisture content for ripping.
  2. For landscape installations, incorporate compost to a depth of 6" into the soil at a rate of a minimum of four (or six) cubic yards per 1,000 square feet of permeable area. Alternatively incorporate a minimum of 1" of quality compost into the planting area topsoil. Greater amendment strategy as recommended by the soils report takes precedence.
  3. Soils with a greater than 6% organic matter in the top 6 inches of soil are exempt from adding compost and tilling.
  4. For heavily compacted bad soil areas consider adding: Incorporate 5/16' minus lava rock at a rate of 3 cubic yards per 1,000 square feet.
- H. Weed Control after 14 days of Watering Planting Areas, Lawn Areas and No Mow Turf Areas
1. After finish grading is complete, apply water in sufficient quantity over a minimum period of 14 days to germinate weed seeds. In areas of subsurface drip irrigation this will require hand watering. When weeds have germinated, kill them with contact herbicide that will not have a detrimental effect on the growth and vigor of the seeds and specified plants. Hand removal with full root removal is also acceptable. Herbicide to be OMRI.

### 3.04 FINISH GRADING

- A. When weeding and soil preparation have been completed and soil has been thoroughly water-settled, grade all planting areas smooth.

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- B. Perform grading operation when soil is at the optimum moisture content for working.
- C. Remove rocks, debris and soil clods 2 inches in diameter and larger and dispose of off-site.
- D. Set finished grades according to Drawings. Float all lawn areas twice in cross directions. Roll, rake and level all other areas as necessary to obtain true, even planting surfaces.
- E. Be familiar with site grading plans and do finished grading in conformance with the plans and as herein specified.
- F. Meet and match adjacent finished surfaces of pavements, drain rim elevations, and other structures. Float all lawn to provide even planting surfaces.
- G. Slope uniformly between given spot elevations. Planting areas to be true to grade within 1 inch when tested in any direction with a 10 foot straight-edge.
- H. Grades not otherwise indicated to be uniform slopes between points where elevations are given, or between points established by paving, curbs or catch basins.
- I. Provide for natural runoff of water without low spots or pockets. Accurately set flow lines according to the drawings. Make finish grades smooth, even and on a uniform plane with no abrupt changes of surface.
- J. Set finished grades as shown on Drawings.
- K. Round tops and toes of all slopes to produce a gradual, natural-appearing transition between relatively level areas and slopes.
- L. Finish surfaces by raking smoothly and evenly. Obtain finish grade approval from Owner's Representative prior to continuing with the work.

**3.05 INSTALLATION**

- A. Verify special protection instructions, clearance and pruning requirements with Owner's Representative prior to planting installation.
- B. Keep plants well watered in containers until planting layout is approved by Owner's Representative.
- C. Do not plant when soil moisture is so great that excessive compaction will occur, nor when it is so dry that dust forms in the air or that clods will not break readily. Apply water if necessary to bring soil to optimum moisture content for tilling and planting.
- D. Lay out trees and shrubs prior to planting, for approval by Owner's Representative. Maintain all plants in their original containers until approval to plant is provided.
- E. Do not install plants with damaged rootballs. Provide 3 shallow vertical score-cuts on the outside of the rootball with a sharp knife before planting. Loosen roots in rootball prior to placing rootball in planting pit.

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- F. Locate planting holes per planting plan or per approved layout while in the field. Bring all conflicts with underground utility lines to the attention of the Owner's Representative.
- G. Compact soil at bottom of pit to support weight of rootball. Set rootball 1 inch above finish grade. Set plants upright, plumb and faced to give best appearance or relationship to each other or adjacent structure. Backfill with amended soil from pit.
- H. Tree Planting:
1. Excavate tree pit to one inch less than the depth of the rootball and with a diameter equal to or greater than the size shown in Plant Pit Size chart on the plans. Sides of pit should be sloped as shown in detail.
  2. Scarify sides of plant pit.
  3. Fill all tree pits with water to test for drainage. If pit drains within eight hours it is acceptable to follow the tree planting detail. If water does not drain within eight hours dig a twelve-inch-diameter sump to four feet deep or to a depth where water drains within eight hour period. Fill sumps with drain rock. Owner's Representative to be present at all tree pit drainage tests. Coordinate test to occur during first or second site visit.
  4. Place rootball on undisturbed soil so that rootball is one inch above finish grade. Adjust position of tree so that trunk is plumb and tree is oriented as approved by Owner's Representative.
  5. Backfill with two-thirds native soil mixed with one-third soil amendment compost
  6. Form watering berm around tree. Make diameter of berm two times diameter of rootball. On sloped sites form berm on downhill side only.
  7. Topdress with mulch inside watering berm keeping mulch six inches clear of trunk.
  8. In lawn areas remove sod at dripline of tree or in a three foot diameter ring minimum around trunks. Topdress with mulch.
- I. Lawn:
1. Moisten planting bed thoroughly.
  2. Hand roll to eliminate irregularities, compact, and ensure good contact.
  3. Lay sod in a straight line, such as along a walkway.
  4. Butt all joints tightly together, without overlapping or leaving spaces between strips of sod. Stagger joints.
  5. Start watering immediately after first strips of sod are laid. When all sod is laid, thoroughly soak sod.
  6. After watering, roll sod with a roller not exceeding 90 lbs. to smooth out bumps and air pockets.
  7. Water thoroughly to wet soil to a depth of 4 inches. Do not let sod dry out.
  8. Mow when turf reaches 3 inches in height. Never remove more than 1/3 of the blade.
- J. Ground Covers: Plant in neat, straight rows parallel to nearest structure, pavement, or fence. Stagger plants in adjacent rows. Plant no closer than 2 feet to trees or shrubs. At edge of paving, plant no closer than one half the plant spacing noted on the plans.

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- K. Vines: Plant vines as close as possible to the structure they are to grow on, and tie to structure.
- L. Ornamental Grasses: Plant crown must be flush with grade. Finish grade adjacent to ornamental grasses to be the same as in the nursery container.
- M. Site and Soil Preparation For Lime Treated Areas: In lime treated areas remove lime treated soil to a depth of 12 to 18" and replace with sandy loam suitable for planting in the entire planting area. Remove to a depth of 2 feet at trees. Prior to backfilling test to confirm bottom of pit will drain via percolation test. If the bottom is not draining slope bottom at 2% or greater. If necessary install drain pipes to carry away water from root zones of trees. No standing water is allowed where trees are planted.
- N. Site and Soil Preparation with Excessive Compaction & Aggregate Base: In areas of excessive compaction & aggregate base order soils test and confirm if existing soils can be satisfactorily amended in place and be satisfactorily free draining. If not, then remove soil to a depth of 12 or 18" and replace with sandy loam suitable for planting in the entire planting area. Remove to a depth of 2 feet at trees. Prior to backfilling test to confirm bottom of pit will drain via percolation test. If the bottom is not draining slope bottom at 2% or greater. If necessary install drain pipes to carry away water from root zones of trees. No standing water is allowed where trees are planted.
- O. Thoroughly water all plantings immediately after planting.
- P. Raise and replant plants which settle to less than one inch above finish grade. Add soil as necessary to fill voids. And adjust finish grades.

**3.06 STAKING TREES**

- A. Stake trees only where required to support the tree, to anchor rootball, or to protect tree from vandalism or wind as directed by Owner's Representative.
- B. Stakes To Support Tree: as stated on the landscape Drawings.
- C. Remove all nursery stakes, ties and tags from plants.

**3.07 MULCH**

- A. Apply 3-inch depth of mulch in all planting areas, except lawn.

**3.08 WEED REMOVAL AND HERBICIDES**

- A. After planting is complete, remove all weeds from planting areas.
- B. Irrigate all planting areas prior to applying organic post-emergent herbicide.
- C. Apply organic pre-emergent herbicide to all non-turf areas in accordance with the manufacturer's recommended rates. Apply herbicides in accordance with EPA label restrictions and recommendations of federal and state laws.
- D. Spot treat weeds as they appear with post-emergent herbicide per manufacturer's recommendations. Take all precautions to avoid overspray onto existing plantings.



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- E. Replace plants showing loss of vigor or health due to improper application of herbicide with new plants of same species and size at no additional cost to the Owner.

**3.09 CARDBOARD SHEET MULCH**

- A. Apply to entire planting area, cover all existing soil and vegetation that has not been removed.
- B. Wet cardboard while applying.
- C. Overlap sheets 8" minimum.
- D. Abut cardboard against edges of pavement, buildings, curbs and boulders.
- E. Abut to edge of installed rootballs without covering top of rootball/ root crown area.
- F. Fold excess cardboard when abutting against objects or at root crown areas to avoid excessive extra scraps.
- G. Recycle all remaining scraps of cardboard.
- H. Top cardboard with 1" layer of compost.
- I. Top compost with a 2" layer of mulch.

**3.10 EDGING**

- A. Set supporting stakes no more than 4 feet apart on straight runs, 2 feet on curved sections, and where necessary to support the headers rigidly in place during construction operation.

**3.11 PROTECTING EXISTING PLANTS**

- A. Before clearing, grading, soil preparation, construction or other work, construct fences around all plants marked to be saved on the plans. Fences to be 5 or 6 feet high minimum, chain link mounted on two-inch diameter galvanized iron posts, driven into the ground to a depth of at least two-feet at no more than ten-foot spacing. Distance from the base of the tree to fence to be determined by the Owner's Representative, at dripline, minimum. Mulch inside fenced area to 3 inch depth. Leave fences in place for the duration of the work.
- B. Do not store or operate mechanical equipment, store construction materials, including soil and mulch, or perform grading procedures within the root zone of trees or shrubs.
- C. Root zone is defined as: Trees: 1½ times the diameter of the tree canopy, measured from the tree trunk; Shrubs: 10 foot radius from the main trunk of the shrub
- D. Do not attach wires, ropes or other devices to any existing plant to be protected, except as needed for the support of the tree. Do not attach any signs, other than a tag showing botanical classification, to any protected plant.

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- E. Warning sign: Prominently display a warning sign on each fence at 20-foot intervals, maximum. Sign should be 8-1/2 inches x 11 inches minimum size and clearly state: "WARNING - Tree Protection Zone – Do not remove this fence except as directed by Owner's Representative."
- F. Periodically spray the leaves of protected plants with water to wash away dust.

**3.12 CLEANING**

- A. Remove topsoil, soil amendments, and excess materials from walks and paved areas. Sweep walks and paved areas clean at the end of each work day. Immediately remove dirt from building walls and paved areas.
- B. Remove empty plant containers from the site on a regular basis, at least once per week. While on site, store containers in an orderly fashion, secure from vandalism. Recycle all containers.
- C. Final Clean-up: In addition to the daily clean-up, remove and legally dispose of all waste materials, including excess materials, trash and debris. Recycle plant containers, product packaging, and other waste products used in this section. Ask plant suppliers if they will accept plant containers for reuse or recycling. Separate plant debris, which can not be incorporated as part of the mulch layer, from other waste and take to a green waste composting facility or transfer station.

**3.13 MAINTENANCE PERIOD**

- A. The maintenance period is 90 days, beginning on the day Provisional Acceptance is authorized by the Owner's Representative.
- B. Use qualified and experienced gardeners to perform maintenance, including but not limited to: watering, weed eradication, cultivating, fertilizing, pest management, clean-up, litter removal, adjusting and repairing tree stakes and ties, and all other operations necessary to assure good plant growth, and a clean, well tended site.
- C. Water: Contractor is responsible for providing water through the construction period up until the permanent water connection is installed.
- D. Replace dead plants immediately with plants of the same species and size as specified.
- E. Any day when the Contractor fails to: adequately water plants, replace unsuitable plants, perform weed eradication, or other work as determined necessary by the Owner's Representative, will not be credited as one of the Maintenance Period days.
- F. In addition to initial fertilization, apply additional OMRI fertilizers as necessary to maintain plant in a healthy, green, vigorous condition during the maintenance period, including but not limited to the following:
  - 1. Topdress lawn with finely screened quality compost after aeration 1-4 times per year.

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2. Fertilize planting areas with naturally occurring non-synthetic fertilizers such as compost tea, organic fertilizer and/or compost per soil testing lab recommendation 30 days after planting and as needed. Fertilizers prohibited by OMRI are not allowed.
- G. Remove all broadleaf weeds a minimum of 3 weeks before final inspection.
- H. IPM to be used for control of weeds. Pre-emergent herbicides are to not be used as a first and only weed control method. Contractor to submit an IPM holistic approach to mitigate weeds and plant diseases.
- I. Do not use herbicides that are not allowed by the OMRI in its generic materials for the maintenance of the landscape. Contractor to submit an IPM holistic approach to mitigate weeds and plant diseases.
- J. Check tree stakes and ties regularly to insure that they are secure and not injuring the trunk. Remove stakes and ties as soon as trees are self-supporting or at end of first season whichever is sooner.
- K. Mulching: Contractor to maintain a minimum of 3" of mulch at all times over soil surface that is not covered by vegetation. Keep mulch 6" away from tree trunks and 4" away from shrub stems. Restore plant basins.
- L. Prune new trees and shrubs only at the direction of the Owner's Representative, except broken or damaged growth or when necessary to enable new tree to support itself.
  1. General: Make all pruning cuts to lateral branches or buds or to the edge of the branch collar. "Stubbing" will not be permitted.
  2. Trees:
    - a. Prune trees to select and develop permanent scaffold branches; to eliminate diseased or damaged growth; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitations; to maintain a natural appearance; and to balance crown with roots; do not top trees.
    - b. Thin and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Prune damaged trees or those that constitute health or safety hazards at any time of the year as required to eliminate these conditions.
    - c. Replace improperly pruned trees with good specimen material, as directed by Owner's Representative.
    - d. Do not remove low lateral branches of young trees. Head back to 5"-6" if necessary.
  3. Shrub pruning should not occur as this is a no-shear landscape design conforming to BFL standards. Do not clip shrubs into balled or boxed forms, unless such is required by the design and directed by the Owner's Representative.
  4. Ornamental Grasses:

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- a. Top dress with 2 inches of mulch in spring and fall.
  - b. Trim yearly to 2 inches above crown when new growth shows at the base to avoid buildup of dead foliage. Use equipment as necessary to avoid shredding foliage.
  - c. Once established, set irrigation schedule for weekly watering.
  - d. Divide clumps every third year in early spring.
- M. Protect all planted areas against trespassing and damage at all times. Repair damage as directed by the Owner's Representative without additional cost to the Owner.
- N. Maintain irrigation system during the maintenance period, using requirements from Section 32 84 00.
- O. Submit weekly maintenance reports, listing tasks completed during each visit, for the first three months. Thereafter, submit reports monthly at a minimum, for the duration of the maintenance period. Submit reports to the Owner's Representative.

**3.14 PROJECT ACCEPTANCE**

- A. Project Acceptance happens at two points in the construction process. Prior to Provisional Acceptance, and through the Maintenance Period to Final Acceptance, continuously maintain all trees, plants, products, and project systems installed under this contract.
- 1. Provisional Acceptance occurs when all project work has been completed and all final Punch List items have been completed to the satisfaction of the Owner's Representative.
  - 2. Notify Owner's Representative ten days prior to end of Maintenance Period for Final Acceptance site visit.
  - 3. Final Acceptance occurs after Provisional Acceptance is authorized and the Maintenance Period has been completed. Final Acceptance is authorized by the Owner's Representative at the conclusion of the Maintenance Period when it is determined that the project is complete, has been properly maintained, trees and plants are in healthy, vigorous condition, and project systems and products are in good working order.

**END OF SECTION**

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**SECTION 33 10 00**

**WATER SYSTEM**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Site water distribution system for domestic and fire protection services up to 5 feet of any on-site building being served.
- B. Related Sections:
  - 1. Section 31 21 00, Utility Trenching and Backfill
  - 2. Section 01 18 13 Sustainable Design Requirements
- C. Related Documents:
  - 1. City of Berkeley Standard Details
  - 2. City of Berkeley Resolution No. 62,693-N.S.: Adopting an Environmentally Preferable Purchasing Policy (EPP)
  - 3. ASME
    - a. ASME A112.1.2: Air Gaps in Plumbing Systems (for Plumbing Fixtures and Water Connect Receptors
    - b. ASME B1.20.1: Pipe Threads, General Purpose, Inch
    - c. ASME B16.1: Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
    - d. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings
    - e. ASME B16.22: Wrought Copper and Copper Alloy Solder – Joint Pressure fittings
    - f. ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes
  - 4. ASTM
    - a. ASTM A536: Standard Specification for Ductile Iron Castings
    - b. ASTM A674: Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
    - c. ASTM B61: Standard Specification for Steam or Valve Bronze Castings
    - d. ASTM B62: Standard Specification for Composition Bronze or Ounce Metal Castings
    - e. ASTM B88: Standard Specification for Seamless Copper Water Tube
    - f. ASTM C94: Standard Specification for Ready-Mixed Concrete

- g. ASTM F1056: Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings
5. AWWA
- a. C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
  - b. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems
  - c. C110: Ductile-Iron and Gray-Iron Fittings
  - d. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - e. C115: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  - f. C116: Protective Fusion-Bonded Epoxy Coatings for the Interior & Exterior Surfaces for Ductile-Iron and Gray-Iron Fittings
  - g. C150: Thickness Design of Ductile-Iron Pipe
  - h. C151: Ductile-Iron Pipe, Centrifugally Cast
  - i. C153: Ductile-Iron Compact Fittings
  - j. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe
  - k. C500: Metal-Seated Gate Valves for Water Supply Service
  - l. C502: Dry-Barrel Fire Hydrants
  - m. C503: Wet Barrel Fire Hydrants
  - n. C504: Rubber Seated Butterfly Valves.
  - o. C508: Swing-check Valves for Waterworks Service, 2 inch through 48 inch NPS.
  - p. C509: Resilient-Seated Gate Valves for Water Supply Service
  - q. C510: Double Check Valve Backflow Prevention Assembly
  - r. C511: Reduced-Pressure Principle Backflow Prevention Assembly
  - s. C512: Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
  - t. C550: Protective Interior Coatings for Valves and Hydrants
  - u. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances
  - v. C606: Grooved and Shouldered Joints
  - w. C651: Disinfecting Water Mains
  - x. C800: Underground Service Line Valves and Fittings
  - y. C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inch for Water Service
  - z. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 65 inch, for Waterworks
  - aa. M41: Ductile-Iron Pipe and Fittings
6. Factory Mutual Insurance Company (FM)
- a. FM 1530: Fire Department Connections
7. National Fire Protection Association (NFPA)
- a. NFPA 24: Installation of Private Fire Service Mains and Their Appurtenances
  - b. NFPA 70: National Electric Code

- c. NFPA 1963: Fire Hose Connection
- 8. National Sanitation Foundation (NSF)
  - a. NSF 61: Drinking Water System Components-Health Effects
- 9. Underwriters Laboratory (UL)
  - a. UL 262: Safety Gate Valves for Fire-Protection Service
  - b. UL 405: Safety Fire Department Connection Devices
  - c. UL 789: Indicator Posts for Fire-Protection Service

## 1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Internal Pressures: As indicated on Plans.
- B. External Load: Earth load indicated by depth of cover plus AASHTO H20 live load unless indicated otherwise.

## 1.3 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Product Data: Manufacturer's literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other marking on equipment made to the specified standards for materials, and settings of selected models, for the following that apply:
  - 1. Piping materials and fittings
  - 2. Gaskets, couplings, sleeves, and assembly bolts and nuts
  - 3. Flexible pipe fittings
  - 4. Restrained pipe fittings
  - 5. Flexible Connectors
  - 6. Expansion joints
  - 7. Flexible expansion joints
  - 8. High deflection fittings/ball joints
  - 9. Gate valves
  - 10. Butterfly valves
  - 11. Check valves
  - 12. Ball valves

13. Pressure reducing valves
  14. Flow Regulating valves
  15. Service connections and water meters
  16. Valve boxes, meter boxes, frames and covers
  17. Backflow preventers
  18. Thrust block concrete mix
  19. Tapping sleeves and tapping valves
  20. Service saddles and corporation stops
  21. Identification materials and devices
- C. Shop Plans and Calculations: Where an on-site fire water system is required, Contractor shall provide shop plans for Engineer and agency approval prior to construction. Coordinate with the Plans and identify any proposed modifications or deviations. Shop Plans and Calculations shall be stamped and signed by a registered Fire Protection Engineer licensed by the State of California as required.
1. Include the following information:
    - a. Design assumptions
    - b. Thrust block sizing and calculations
    - c. Materials to be used
    - d. Available water pressure
    - e. Required water pressure
  2. The review of fire system components constitutes only a portion of the review and approval required. A copy of the fire system component submittal package shall be forwarded to the local fire marshal for further review and approval.
- D. Water Pressure Report: At the conclusion of work, the Contractor shall engage a qualified testing service to conduct a flow test of the existing system (providing flow test data for all mains and at least six (6) hydrants). Provide date and location of test, type and method of test performed, static pressure and residual pressure in psig, observed flow in gpm, and orifice size.
- E. Shop drawings: Include plans, elevations, details and attachments.
1. Precast and cast in-place vaults and covers
  2. Wiring diagrams for alarm devices
- F. Field test reports: Indicate and interpret test results for compliance with the Project requirements.



## 1.4 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water. Do not operate existing valves or tap existing piping without written permission and/or presence of utility company representative.
- B. Comply with the following requirements and standards:
  - 1. NSF 61: "Drinking Water System Components-Health Effects" for materials for potable water.
  - 2. NFPA 24: "Installation of Private Fire Service Mains and Their Appurtenances" for materials, installations, tests, flushing, and valve and hydrant supervision.
  - 3. NFPA 70: "National Electric Code" for electrical connections between wiring and electrically operated devices.
- C. Provide listing/approval stamp, label, or other marking on piping and specialties made to a specified standard.

## 1.5 MATERIAL DELIVERY, STORAGE AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe end damage and to prevent entrance of dirt, debris and moisture.
- C. Handling: Use slings to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. During Storage: Use precautions for valves, including fire hydrants according to the following.
  - 1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
  - 2. Protection from Weather: Store indoors and maintain temperature higher than ambient dew-point temperature. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- E. Do not store plastic pipe and fittings in direct sunlight.

- F. Protect pipe, fittings, flanges, seals and specialties from moisture, dirt and damage.
- G. Protect linings and coatings from damage.
- H. Handle precast boxes, vaults and other precast structures according to manufacturer's written instructions.
- I. Protect imported bedding and backfill material from contamination by other materials.

## 1.6 COORDINATION

- A. Coordinate connection to existing water mains with water utility supplying water.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building domestic water distribution piping and fire protection piping.

## PART 2 - PRODUCTS

### 2.1 PE PLASTIC PIPES: SIZES 1/2 INCH THROUGH 3 INCH

- A. Pipe and Fittings: Provide PE3408, Pressure Class 200, DR 9 conforming to AWWA C901. PWPIPE, or approved equal.
- B. Cast Copper Fittings shall conform to ASME B16.18.
- C. Cast Copper Compression Fittings and connections shall be Mueller 110, Ford or approved equal.
- D. Joints: Restrain with clamps or heat-fusion.

### 2.2 PE PIPE: SIZES 4 INCH THROUGH 64 INCH

- A. Pipe and Fittings: AWWA C906
- B. Joints:
  1. Thermal Butt Fusion: AWWA C906 and pipe manufacturer's recommendations
  2. Flanged joints: AWWA C906 and pipe manufacturer's recommendations

### 2.3 FLEXIBLE CONNECTORS

- A. Flanged Coupling Adapters for plain end pipe at fittings, valves and equipment shall be Dresser Style 127 or 128, similar models by ITT; Baker Coupling Company or approved equal. Nuts, bolts and other hardware shall be Type 304 stainless steel.
- B. Mechanical Couplings shall be rated for a minimum working pressure of 150 psi. The barrel shall be a minimum 10 inches long. Couplings shall be cleaned and shop primed with manufacturer's standard rust inhibitive primer. Mechanical couplings shall

be Smith-Blair, Romac, JCM, Apac or approved equal, with stainless steel nuts, bolts, and threaded rods.

- C. Flexible Coupling for Steel Pipe shall be Dresser Coupling Style 38 with EPDM gaskets, or approved equal.

#### 2.4 EXPANSION JOINT

- A. An expansion joint shall be installed at location indicated on the Plans and shall be manufactured of ductile iron conforming to the material properties of AWWA C153.
- B. Separation beyond the maximum extension of the expansion joint shall be prevented without the use of external tie rods.
- C. The expansion joint shall be pressure tested against its own restraint to a minimum of 250 psi.
- D. All pressure containing parts shall be lined with a minimum of 15 mils of fusion bonded epoxy, conforming to the applicable requirements of AWWA C213, and shall be tested with a 1500-volt spark test conforming to stated specification.
- E. Mechanical or Flanged Joint: The expansion joint shall be Model Ex-Tend 200, 4 inch through 36 inches, as manufactured by EBAA Iron, Inc., or approved equal.
- F. TR Flex Joints: TR Flex Telescoping Sleeve, 4 inch through 64-inch, U. S. Pipe.

#### 2.5 FLEXIBLE EXPANSION JOINTS

- A. Flexible expansion joints shall be installed at locations indicated on the Plans and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and AWWA C153.
- B. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 250 psi. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply.
- C. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of 15°, and 6 inches minimum expansion. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts.
- D. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61.
- E. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C116
- F. Polyethylene sleeves, meeting AWWA C105, shall be included for direct buried applications.

- G. Flanged or mechanical Joint: Flexible expansion joint shall be Force Balanced FLEX-TEND, sizes 3 inch through 48 inch, as manufactured by EBAA Iron, or approved equal.
- H. Flanged Joint: Starflex, Series 5000, Star Pipe Products, or approved equal.
- I. Plain End to Plain End Pipe: "Xtra Flex," sizes 4 inch through 24-inch, U. S. Pipe, or approved equal.

## 2.6 HIGH DEFLECTION FITTINGS/BALL JOINTS

- A. Plain End Pipe: Xtra Flex Restrained Joint High Deflection Fittings, 4 inch through 24-inch, U. S. Pipe, or approved equal.
- B. Mechanical or Flanged Joint: Flex 900, 4 inch through 12 inch, EBAA Iron, or approved equal.

## 2.7 GATE VALVES

- A. Provide valves conforming to AWWA C500 or AWWA C509
- B. Valves shall be resilient-seated, with non-rising stem, gray or ductile-iron body and bonnet, with bronze or gray or ductile-iron gate, bronze stem and square stem operating nut unless noted otherwise.
- C. [Metal seated, AWWA C500, and rubber seated, AWWA C504, are also available.]
- D. All bolts, nuts and washers, except operating nut, shall be stainless steel.
- E. Stem operating nut to be 2 inches square and open counter-clockwise.
- F. Stem extensions shall be installed to bring the stem operating nut to within 2 feet of finish grade where the depth from finish grade to the stem operating nut exceeds 4 feet.
- G. Equip valves in pump stations and other interior or vault installations with hand-wheels.
- H. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer's recommendations.
- I. For the domestic water system, valves shall also conform to NSF 61.
- J. Service vine Valves and fittings, 2 inch and smaller shall be in accordance with AWWA C800
- K. Where a post indicator is shown, provide valve with an indicator post flange.
- L. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the project include, but are not limited to, the following:

1. Mueller Company
2. M&H Valve Company
3. Crane Company, or approved equal

## 2.8 SWING CHECK VALVES

- A. Provide swing-check type valves conforming to AWWA C508.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  1. Mueller Company
  2. M&H Valve Company
  3. DeZurik/APCO
  4. Watts, or approved equal

## 2.9 BALL VALVES

- A. Provide ball valves (6 inch through 48 inch) per AWWA C507 as manufactured by Crane Company, or approved equal.
- B. Provide ball valves (2 inches and smaller) conforming to AWWA C800 as manufactured by Mueller 300 Series, Ford, or approved equal.
- C. Valves shall open by counterclockwise rotation of the valve stem.
- D. Provide valves with ends as appropriate for the adjoining pipe.
- E. Provide valve with lockable operating nut or handle as shown on the Plans.

## 2.10 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

- A. Air release and vacuum valves: Provide valve and service size as shown on the Plans. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300 psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin, DeZurik/APCO or approved equal.
- B. Combination air valves: Provide valve and service size as shown on the Plans. Valve shall have cast-iron single valve or double valve body, and shall conform to AWWA C512. A simple or compound lever system shall have a maximum operating pressure of 300 psi. Provide a protective cap for the outlet of the valve.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the project include, but are not limited to, the following:

1. Crispin
2. DeZurik/APCO, or approved equal

## 2.11 BLOW-OFF VALVES

- A. Provide valve and service size as shown in the Plans. Provide 2-inch valves at low points of the piping system, and 4-inch valves at dead-ends of the piping system, unless otherwise directed by the Engineer.
- B. 2-inch blow-off shall have a 2-inch vertical female iron pipe (FIP) inlet and a 2-inch normal pressure and temperature (NPT) nozzle outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF550, or approved equal.
- C. 4-inch blow-off shall have all brass principal working parts, 4-inch inlet and outlet and is self-draining and non-freezing. Valve shall open by counterclockwise rotation of a top-mounted 2-inch square operating nut. All working parts shall be serviceable without excavation.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
- E. Kupferle/ MainGuard #7600, or approved equal

## 2.12 PRESSURE-REDUCING VALVES

- A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250 psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment.
- B. Valves shall have flanged ends. Valves sized 3 inches or smaller may have screwed ends.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  1. Cla-Val Company
  2. Bermad
  3. Ames Company, or approved equal

## 2.13 FLOW-REGULATING VALVES

- A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250 psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for flow adjustment. Details as indicated.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  - 1. Cla-Val Company
  - 2. Bermad
  - 3. Ames Company, or approved equal

#### 2.14 SERVICE CONNECTIONS AND WATER METERS

- A. Service connections and water meter details and boxes as indicated.

#### 2.15 VALVE BOXES, METER BOXES, FRAMES AND COVERS

- A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel or cast-iron traffic cover marked "WATER". Christy Model G5 with G5C cover or approved equal.
- B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Construction Documents. Provide a precast concrete utility box for each buried appurtenance. Provide a traffic-rated lid for H2O loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equal.

#### 2.16 BACKFLOW PREVENTER - REDUCED PRESSURE PRINCIPLE ASSEMBLIES (RPPA)

- A. Provide RPPA consisting of two independently operating check valves with a pressure differential relief valve located between the two check valves, two shut-off valves and four test cocks. RPPA shall be tamper-proof and conform to AWWA C511. Valve shall have an outside screw (OS) gate valve on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves for continuous-pressure application.
- B. Body:
  - 1. 2 inch and Smaller: Bronze with threaded ends
  - 2. 2 ½ inch and Larger: Bronze, cast iron steel, or stainless steel with flanged ends
- C. Interior Lining: AWWA C550, epoxy coating for cast iron or steel bodies
- D. Interior Components: Corrosion-resistant materials
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  - 1. Cla-Val Company
  - 2. Ames Company

3. Febco, CMB Industries, Inc.
4. Hersey Products, Inc.
5. Watts
6. Zurn/Wilkins, or approved equal

#### 2.17 BACKFLOW PREVENTER - DOUBLE CHECK DETECTOR ASSEMBLY (DCDA)

- A. Provide a cast-iron body DCDA consisting of mainline double check assemblies in parallel with a bypass double check and meter assembly, two shut-off valves and four test cocks. DCDA shall be tamper-proof and conform to AWWA C510. FM approved or UL listed, with outside screw and yoke (OS&Y) gate valve on inlet and outlet, and strainer on inlet. Include two positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous pressure application.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  1. Cla-Val Company
  2. Ames Company
  3. Febco, CMB Industries, Inc.
  4. Hersey Products, Inc.
  5. Zurn/Wilkins, or approved equal

#### 2.18 POST INDICATOR VALVE

- A. General: UL 789, FM approved, vertical-type, cast-iron body with operating wrench extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  1. Mueller Company
  2. Clow Corporation
  3. American Cast Iron Company

#### 2.19 FIRE DEPARTMENT CONNECTION

- A. Exposed, sidewalk or Freestanding Type Fire Department Connection: UL 405, cast brass body with threaded inlets according to NFPA 1963 and matching local fire department hose threads and threaded bottom outlet. Include lugged caps, gaskets



and chains; lugged swivel connections and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate. Number of inlets shall be as shown on the Plans. Clapper and spring check inlets shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Outlet shall be sized for simultaneous use of all inlets. Connection shall be branded "Building XX".

1. 2-Way FDC: Connection shall conform to UL 405 or FM 1530. Elkhart, Croker, or approved equal.
2. 3-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Elkhart, Croker, Potter-Roemer or approved equal.
3. 4-Way FDC: Connection shall conform to UL 405. Potter-Roemer, Croker, or approved equal.
4. 6-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Croker, Potter-Roemer or approved equal.

## 2.20 FIRE HYDRANTS

- A. Provide two 2 ½ inch and one 4 ½ inch outlets, with a 6-inch nominal inside diameter inlet and break-away type bolts. Hydrant shall have a working pressure of 250 psi and shall conform to AWWA C502 or C503, and be UL listed and FM approved. Provide hydrants of one manufacturer. Clow model 960 series or approved equivalent, subject to approval of the Owner and fire marshal.

## 2.21 THRUST BLOCKS

- A. Use concrete conforming to ASTM C94 having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one-part cement, 2 ½ parts sand, and 5 parts gravel, having the same minimum compressive strength.
- B. Provide thrust blocks or mechanical pipe restraints at all fittings and changes in angle, alignment or elevation.
- C. Where depth or location of existing structures prohibit the use of standard thrust blocks, gravity blocks may be used.

## 2.22 TAPPING SLEEVES AND TAPPING VALVES

- A. Tapping sleeves shall be epoxy coated and furnished with stainless steel washers, nuts and bolts. Mueller H-615 and H-619, Ford, or approved equal.
- B. Tapping valves shall have flanged inlet, Class 125 conforming to ASME B16.1 and furnished with stainless steel washers, nuts and bolts. Tapping valves shall be constructed with a mechanical joint outlet. Mueller T-687, T-642, T-681, or approved equal.

## 2.23 SERVICE SADDLES AND CORPORATION STOPS

- A. Service Saddles: Saddles shall conform to AWWA C800 and NSF 61.

1. For DIP: Provide bronze or stainless-steel body, double strap type with a 200-psi maximum working pressure. Mueller BR2 Series, Ford, or approved equal.
  2. For PE: Per manufacturer's recommendations.
- B. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi and suitable for the working pressure of the system.
1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
  2. Threaded ends shall conform to AWWA C800.
  3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
  4. Mueller H-15000 Series with "CC" threads and a copper flare straight connection outlet, Ford, or approved equal.

## 2.24 IDENTIFICATION MATERIALS AND DEVICES

- A. Warning Tape: Provide warning tape consisting of metallic foil bonded to solid blue plastic film not less than 3 inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1 mil thick. The tape continuously shall have printed black-letter, not less than  $\frac{3}{4}$  inch high, message reading "CAUTION: WATER MAIN BELOW".
- B. Tracer Wire for Nonmetallic Piping: Provide 12 guage, coated copper or aluminum wire not less than 0.10 inch in diameter, with blue THW, THWN, or THHN rated insulation, in sufficient length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

## PART 3 -EXECUTION

### 3.1 PIPE INSTALLATION

- A. Pipe Depth and Trench Configuration: Conform to elevations, profiles and typical trench section(s) shown on the Plans.
- B. Excavation, Bedding, Backfill, and Compaction: Section 31 21 00 – Utility Trenching and Backfill.
- C. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer's recommendations.
- D. Pipe laying and jointing:
1. Provide proper facilities for lowering sections of pipe into trenches.
  2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.

3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.
5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
6. Support pipe at proper elevation and grade.
7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown on the Plans.

E. Installation of Tracer Wire:

1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.
3. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance. Extend the wire up the outside of the valve box/riser and cut a hole that is 8 inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, terminate the 12-inch wire lead inside the enclosure.
4. Splice wire with a splicing device consisting of an electro-tin-plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.

F. Installation of Warning Tape

1. Install tape approximately 1 foot above and along the centerline of the pipe.
2. Where tape is not continuous, lap tape ends a minimum of 2 feet.

- G. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. If necessary, use shorter than the standard lengths of pipe to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.
- H. Connections to Existing Lines:
  - 1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
  - 2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.
- I. Closure: Close open ends of pipes and appurtenance openings at the end of each day's work or when work is not in progress.

### 3.2 INSTALLATION OF POLYETHYLENE PIPING

- A. Install pipe, fittings, and appurtenances in accordance with manufacturer's recommendations.
- B. Jointing:
  - 1. Provide mechanical joints, compression fittings, or flanges as recommended by the manufacturer.
  - 2. Jointing shall be performed using proper equipment and machinery by trained and certified personnel.
  - 3. Joints, fittings and tools shall be clean and free of burrs, oil, and dirt.
  - 4. Butt fusion:
    - a. Pipe ends shall be faced to establish clean, parallel mating surfaces.
    - b. Align and securely fasten the components to be joined squarely between the jaws of the joining machine.
    - c. Heat the ends of the pipe to the pipe manufacturer's recommended temperature interface pressure and time duration. A pyrometer or other surface temperature measuring device should be used to insure proper temperature of the heating tool. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
    - d. Prevent molten plastic from sticking to the heater faces. Molten plastic on the heater faces shall be removed immediately according to the tool manufacturer's instructions.
    - e. Bring the molten ends together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. Hold the molten joint under pressure until cooled adequately to develop strength. Refer to the manufacturer's recommendations for temperature, pressure, holding, and cooling times.
    - f. Remove the inside bead from the fusion process using Manufacturer's recommended procedure.

C. Socket fusion:

1. Mixing manufacturers' heating tools and depth gauges will not be allowed unless the tools conform to ASTM F1056.
2. Pipe ends shall be faced square to establish clean, parallel mating surfaces.
3. Clamp the cold ring on the pipe at the proper position using a depth gauge.
4. Heat the tool to the pipe manufacturer's recommended temperature. A pyrometer or other surface temperature measuring device should be used to insure proper temperature. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
5. Follow manufacturer's recommendations for bringing the hot tool faces into contact with the outside surface of the end of the pipe and the inside surface of the socket fitting.
6. Simultaneously remove the pipe and fitting from the tool.
7. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion.
8. Hold or block the pipe in place during cooling.

D. Electrofusion:

1. Unless the operation is for a saddle-type electrofusion joint, pipe ends shall be faced square to establish clean, parallel mating surfaces.
2. Clamp the pipe and fitting at the proper position in the fixture.
3. Connect the electrofusion control box to the fitting and to the power source. Apply the electric current using manufacturer's instructions.
4. Allow the joint to cool before removing the clamping fixtures.

### 3.3 INSTALLATION OF VALVES

A. Gate Valves

1. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.
2. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.

- B. Check Valves: Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.
- C. Joints:
  - 1. Valves on DI, PE and PVC Pipe: Mechanical joint valves for buried locations. Flanged-end valves for installation in vaults/pits.
  - 2. Valves on Steel Pipe: As indicated for buried locations. Flanged-end valves for installation in vaults/pits.

#### 3.4 INSTALLATION OF VALVE AND METER BOXES

- A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown on the Plans. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxes shall be excavated, plumbed, and backfilled at no additional cost to the Owner.

#### 3.5 INSTALLATION OF FIRE HYDRANTS

- B. Install fire hydrants, except for metal harness, plumbed vertical, in accordance with AWWA C600 for hydrant installation and as indicated.
- C. Provide and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Hydrants shall be set so that mounting bolts clear the top of finished grade by three inches so bolts may be easily replaced if needed.
- D. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached.

#### 3.6 SERVICE LINE CONNECTIONS TO WATER MAINS

- A. Connect service lines of size shown on plans to the main with a rigid connection or a corporation stop and gooseneck. Install a gate valve on the service line.
- B. Connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.
- C. Connect service lines to PVC plastic water mains in accordance with the recommendations of AWWA Manual M23.

#### 3.7 INSTALLATION OF BACKFLOW PREVENTERS

- A. Backflow devices shall be installed horizontal and level, with three feet minimum clearances from obstructions.

#### 3.8 ANCHORAGE INSTALLATION

- A. Mechanically Restrained Joints: Install where indicated for lengths indicated in accordance with manufacturer's instructions.

- B. PCC Thrust Blocks: Install where required and as indicated. Bearing area indicated is to be against undisturbed earth. Allow a minimum of 24 hours curing time before introducing water into the pipeline and allow a minimum of 7 days curing time before pressure testing.

### 3.9 CONNECTION TO EXISTING

- A. Contractor shall submit a work plan delineating the work sequence and duration of each task.
- B. The Contractor to submit a contingency plan in case work extends beyond the allowable shutdown duration
- C. Contractor to verify with City of Berkeley on the total allowed duration of shutdown.
- D. Contractor to notify Owner 48 hours prior to shut down.
- E. Prior to shut down the Contractor shall have the following:
  - 1. Approved submittals for the work to be done
  - 2. Approved work plan
  - 3. Approved contingency plan
  - 4. The material, tools and equipment necessary to do the work, including pumps, generator, lighting, etc.
- F. No work shall be done within two weeks from a wet weather event.
- G. Contractor to check the weather (NOAA website) and plan work during dry weather period.

### 3.10 HYDROSTATIC PRESSURE AND LEAKAGE TEST

- A. General:
  - 1. Provide all necessary materials and equipment, including water.
  - 2. Backfill all trenches sufficient to hold pipe firmly in position.
  - 3. Allow time for thrust blocks to cure prior to testing.
  - 4. Flush all pipes prior to testing to remove all foreign material.
  - 5. Perform pressure and leakage test concurrently.
  - 6. Apply test pressure by means of a pump connected to the pipe.
  - 7. Base test pressure on the elevation of the lowest point in the line.
  - 8. Fill each closed valve section or bulk-headed section slowly. Expel air from section being tested by means of permanent air vents installed at high points or

by means of temporary corporation cocks installed at such points. Remove and plug the temporary corporation cocks at the conclusion of the test.

9. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
10. The pressure test on mortar-lined pipe shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption in the cement mortar lining.
11. Allow the system to stabilize at the test pressure before conducting the leakage test.
12. Do not operate valves in either the opening or closing direction at differential pressures above the valves rated pressure.
13. Maintain test pressure as specified for type of pipe being tested.
14. Pressure Test: Examine any exposed pipe, fittings, valves, hydrants and joints during the test, if no leaks are observed the section of line has passed the pressure test. If leaks are observed, repair any damaged or defective pipe, fittings, valves, or hydrants, and repeat the pressure test.
15. Leakage Test: Perform as specified hereafter for the type of pipe being installed.

#### B. Preparation for Test

1. Vents shall be provided at the high points of the system and drains provided where means of venting or draining do not exist.
2. Remove or block off, all relief valves, rupture discs, alarms, control instruments, etc. that shall not be subjected to the test pressure.
3. All discs, balls, or pistons from check valves shall be removed if they interfere with filling of the system. Open all valves between inlet and outlet of the section to be tested.
4. Connect pump and provide temporary closures for all of the external openings in the system. Use caution to ensure that the closures are properly designed and strong enough to withstand the test pressure.
5. A joint previously tested in accordance with this specification may be covered or insulated.
6. Expansion joints shall be provided with temporary restraint for additional pressure under test or shall be isolated from the test.
7. Flanged joints, where blanks are inserted to isolate equipment during the test, need not be tested.

#### C. PE Pipe Leakage Test:



1. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
2. Apply the test pressure and allow the pipe to stand, without makeup pressure, for sufficient time to allow for diametric expansion or pipe stretching to stabilize, approximately two to three hours.
3. After the above stabilization has occurred, return the section being tested to the test pressure. Hold the test pressure for four hours. If the pressure in the test section drops, and it is determined the drop may be the result of expansion resulting from increasing temperature, a limited amount of additional water may be added to bring the pressure back to the test pressure. Allowable amounts of make-up water, to compensate for expansion due to increasing temperature, are as shown in the following table. Make-up water is only allowed during this final test period and not during the initial stabilization described in the previous paragraph. If the additional water added is less than the allowable shown in the table and there are no visual leaks or significant pressure drops, the tested section passes the test.

Nominal Pipe Size (in.) Test	Allowance for Expansion (U.S. Gals. /100 Feet of Pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.50
10	0.75	1.3	2.1
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

### 3.11 CLEANING

- A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Owner will examine the pipes for

leaks. If any further defective pipes or joints are discovered, the Contractor shall repair them. Finished paving shall not be installed prior to completion of all cleaning and testing.

### 3.12 DISINFECTION OF PIPELINES

- A. After completion of the hydrostatic test, the mains shall be thoroughly flushed with a minimum pipe velocity of 2.5 fps and chlorinated in accordance with the latest revision of AWWA 651, Standards of Disinfecting Water Mains. Any one of the methods therein described may be used, with the additional requirement of 50 ppm chlorination minimum initial application. At the end of the contact period, the mains shall again be flushed, and bacteriological samples taken.
- B. If necessary, the Contractor shall provide, at his expense, outlets from which to take the samples. The location of the chlorination and sampling points will be determined by the Owner in the field. Taps for chlorination and sampling shall be installed. The Contractor shall uncover and backfill the taps as required.
- C. Disinfection of tie-ins shall be performed by the Contractor by swabbing with chlorine or by other approved methods. Following a tie-in, the area affected by the tie-in shall be thoroughly flushed and bacteriological samples will be taken as deemed necessary.
- D. All treated water flushed from the lines shall be dechlorinated and disposed of by discharging to the locations identified in the Plans, or by other approved means. No discharge of chlorinated water to any storm sewer or natural water course will be allowed, unless properly dechlorinated.
- E. The Contractor shall rechlorinate and retest any lines that do not meet the requirements of the above testing. The line shall not be placed in service until the requirements of the State Public Health Department are met.

### BACTERIOLOGICAL TESTING

- A. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory approved by the Owner.
- B. Water samples are to be taken at representative points no less than one test per 500 feet of pipe, plus one test at each end of the pipe; or as required by the Owner.
- C. After the samples have passed the bacteriological testing, the Contractor will be notified and arrangements can be made to make tie-ins and connections to house services.
- D. Each water sample will have passed the bacteria tests if they show zero total coliform per 100 ml and not more than 50 non-sheen bacteria per 100 ml, and when the turbidity is no greater than the source water.
- E. Samples shall be taken no sooner than 24 hours after final flushing.
- F. Jumpers and/or plates shall be pulled within 14 days of the notification of a successful test, or new bacteria samples will have to be taken.
- G. Follow-up bacteriological testing shall take place after tie-ins have been made, and shall meet the same passing requirements as the initial tests.

**END OF SECTION**



**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

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**SECTION 33 30 00**

**SANITARY SEWER SYSTEM**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Sanitary gravity sewers and force mains up to five feet from any on-site building
  
- B. Related Sections:
  - 1. Section 31 21 00, Utility Trenching and Backfill
  - 2. Section 01 18 13 Sustainable Design Requirements
  
- C. Related Documents:
  - 1. City of Berkeley Standard Details
  - 2. City of Berkeley Resolution No. 62,693-N.S.: Adopting an Environmentally Preferable Purchasing Policy (EPP)
  - 3. AASHTO
    - a. M199: Standard Specification for Precast Reinforced Concrete Manhole Sections
    - b. M252: Standard Specification for Corrugated Polyethylene Drainage Pipe
  - 4. ASTM
    - a. A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
    - b. ASTM A674: Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
    - c. C143: Standard Test Method for Slump of Hydraulic-Cement Concrete
    - d. C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
    - e. C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
    - f. C923: Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
    - g. C1173: Standard Specification for Flexible Transition Couplings for Underground Piping Systems
    - h. C1244: Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

- i. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
  - j. D4101: Standard Specification for Propylene Injection and Extrusion Materials
  - k. F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
  - l. ASTM F1056: Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings
5. AWWA
- a. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems
  - b. C110: Ductile-Iron and Gray-Iron Fittings
  - c. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - d. C115: Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
  - e. C116: Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
  - f. C150: Thickness design of Ductile Iron Pipe
  - g. C151: Ductile-Iron Pipe, Centrifugally Cast
  - h. C153: Ductile-Iron Compact Fittings
  - i. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe
  - j. C512: Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
  - k. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - l. C606: Grooved and Shouldered Joints
  - m. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. for Waterworks
6. Caltrans Standard Specifications, 2022
- a. Section 51, Concrete Structures
  - b. Section 65, Concrete Pipe
  - c. Section 75 Miscellaneous Metal
  - d. Section 90, Concrete
7. Federal Specification
- a. SS-S-00210 (GSA-FSS)

## 1.2 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Product data for the following:
  - 1. Piping materials and fittings
  - 2. Special pipe couplings

3. Joint sealants
4. Cleanout plugs or caps
- C. Shop drawings: Include plans, elevations, details and attachments for the following:
  1. Precast concrete manholes, frames and covers
  2. Precast concrete clean out boxes and box covers
- D. Design Mix Reports and Calculations: For each class of cast in place concrete
- E. Field Test Reports: Indicate test results for compliance with performance.

### 1.3 DELIVERY, STORAGE AND HANDLING

#### A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

#### B. Handling

1. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.
2. Handle precast concrete pipe, manholes and other precast structures according to manufacturer's written instructions.
3. Protect imported bedding and backfill material from contamination by other materials.

## PART 2 - PRODUCTS

### 2.1 HDPE PIPE AND FITTINGS: 4 INCH THROUGH 10 INCHES

- A. Pipe shall be in accordance with AASHTO M252 Type S, smooth interior and corrugated exterior.
- B. Bell and spigot joints
- C. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F477

- D. Couplings: AASHTO M252, corrugated band type, engage a minimum of 4 corrugations, 2 on each side of pipe joint

## 2.2 GRAVITY PIPE CLEANOUTS

- A. Piping: Same as sanitary sewer line if possible
- B. Top Cap: Threaded and of same material as piping if possible
- C. Box Size: As required to provide access and allow easy removal and reinstallation of cap
- D. Box Types:
  - 1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty
  - 2. Traffic Areas: Portland cement concrete box and box cover or steel or cast-iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading
- E. Box Cover Markings: "SANITARY SEWER" unless otherwise specified
- F. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to the following:
  - 1. Associated Concrete Products, Inc.
  - 2. Brooks Products Inc.
  - 3. Christy Concrete Products, Inc., or approved equal

## 2.3 MANHOLES

- A. Manholes shall be pre-cast concrete of the size and shape shown on the Plans and shall conform to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Caltrans Type I/II cement. Rate for AASHTO H20 loading in traffic areas.
  - 1. All interior concrete surfaces shall be coated with "Xypex Crystalline" or approved equivalent. Use of a water-resistant admix is acceptable, at Contractor option.
  - 2. Frames and Covers: As indicated and in accordance with Caltrans Standard Specification Section 75-2.02B. Manhole covers shall have the words "SANITARY SEWER" in letters not less than 2 inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.
  - 3. Frames and lids for manholes shall be match-marked in pairs before delivery to the job site. The lids shall fit into their frames without rocking.
  - 4. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Plans. Bars shall be of the round deformed type, free from injurious

seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.

5. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of Caltrans Standard Specifications Section 90 and as specified herein. The concrete shall be Class "A" containing six (6) sacks of portland cement per cubic yard of concrete. The grading of the combined aggregate shall be in accordance with the Caltrans requirements of the three-quarter inch maximum. The consistency of the concrete shall be such that the slump does not exceed four inches, as determined by ASTM C143. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.
6. Steps: ASTM C478 or AASHTO M199. Manufacture from deformed, ½ inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, or equal.

## 2.4 JOINT SEALANT FOR STRUCTURES AND MANHOLES

### A. Mortar: Caltrans Standard Specification Section 51-1.02F

1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.

### B. Gaskets: Preformed flexible rubber or plastic gasket

1. Rubber Gaskets: ASTM C443
2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is "Ram-Nek," as manufactured by the Henry Company, or equal

## 2.5 SERVICE LATERAL RECONNECTIONS

- ### A. Service lateral reconnections shall be made using a PVC SDR 26 45 degree Wye; sized to fit the sewer main and the diameter of the sewer lateral.

## 2.6 PIPE TO STRUCTURE CONNECTOR/SEAL

- ### A. A flexible pipe to manhole connector shall be used for all pipe penetrations to pre-cast and/or cast-in-place concrete structures.

1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.



2. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C923. The connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C923.
3. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
4. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

## **PART 3 - EXECUTION**

### **3.2 GRAVITY PIPE INSTALLATION**

- A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-2.03 for reinforced concrete pipe and chapter 11.3.3 of AWWA M41 for ductile iron pipe.
- B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.
- C. Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill.
- D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with the manufacturer's recommendations.
- E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.
- F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.
- G. Closure: Close open ends of pipes and appurtenance at the end of each day's work or when work is not in progress.

### 3.3 **INSTALLATION OF POLYVINYL CHLORIDE PIPING**

- A. Comply with the recommendations for pipe installation, joint assembly and appurtenance installation in AWWA M23.
- B. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.
- C. Jointing:
  - 1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
  - 2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
  - 3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
  - 4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
  - 5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the applicable requirements of AWWA C600 for joint assembly.
  - 6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
  - 7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.
- D. Pipe Anchorage:
  - 1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Plans.

### 3.4 **SPECIAL PIPE COUPLINGS**

- A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
- B. Installation: Manufacturers' instructions

### 3.5 **POURED-IN-PLACE CONCRETE**

- A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of Caltrans Standard Specifications.

- B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the Caltrans Standards Specifications. Unless otherwise noted herein or in the Plans, exposed surfaces of structures shall be Class 1 surface finish.
- C. Curing shall conform to applicable portions in Section 90 of Caltrans Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.
- D. Concrete shall not be cropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

**E. GRAVITY PIPELINE AIR TESTING AND FLUSHING**

- 1. All new sections of sanitary sewer shall be tested using the following procedures:
  - a. Test is conducted between two consecutive manholes, or as directed by the Project Manager.
  - b. The test section of the sewer shall be plugged at each end. One of the plugs used at the manhole shall be tapped and equipped for the air inlet connection for filling the line from an air compressor.
  - c. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowout.
  - d. Connect air hose to tapped plug selected for the air inlet. Connect the other end of the air hose to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate into the sewer test section, and to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.
  - e. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
  - f. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psig is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig.
  - g. When constant pressure of 3.5 psig is reached, throttle the air supply to maintain the internal pressure above 3.0 psig for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period, it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap plug, release the pressure in the line and tighten all leaky caps and plugs. Start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval must be allowed after the pipeline has been refilled.
  - h. After the stabilization period, adjust the air pressure to 3.5 psig and shut-off or disconnect the air supply. Observe the gauge until the air pressure reached 3.0 psig. At 3.0 psig, commence timing with a stopwatch until the pressure drops to 2.5 psig, at which time the stop watch is stopped. The time required,

as shown on the stopwatch, for a pressure loss of 0.5 psig is used to compute the air loss.

- i. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at any time.
- j. If the time, in minutes and seconds, for the 0.5 psig drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

#### Requirements for Air Testing

Pipe Size (in inches)	Time	
	Minutes	Seconds
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	30

- k. For 8 inch and smaller pipe, only: if, during the 5-minute saturation period, pressure drops less than 0.5 psig after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.
- l. Multi-pipe sizes: when the sewer line undergoing test is 8 inch or larger diameter pipe and includes 4-inch or 6-inch laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, the Project Manager can compute the “average” size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psig for the “averaged” diameter pipe.
- m. Adjustment Required for Groundwater:
  - 1) An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
  - 2) Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
    - a) Install a ½ inch diameter pipe nipple (threaded one or both ends, approximately 10-inch long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.
    - b) Seal pipe nipple with a threaded ½ inch cap.
    - c) Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the

- pipe nipple to remove any obstruction, and then connecting a clear plastic tube to the pipe nipple.
- d) Hold plastic tube vertically permitting water to rise in it to the groundwater level.
  - e) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
  - f) Determine air pressure correction, which must be added to the 3.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.
2. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

## **F. TESTING OF MANHOLES ON GRAVITY LINES**

1. At the option of the Contractor, either the following hydrostatic or vacuum test shall be performed.
  - a. Hydrostatic Test: In general, the following hydrostatic test is in conformance with that presented in the City of Berkeley Standard Specifications.
  - b. Insert inflatable plugs in all sewer inlets and outlets.
  - c. Fill the manhole with water to a point six inches below the base of the manhole frame.
  - d. Maintain the water at this point for one hour to allow time for absorption.
  - e. Begin one-hour test period. Measure the amount of water added in one-hour period to maintain the water level at six inches below the base of the manhole frame. Do not allow water level to drop more than 25% of the manhole depth.
  - f. Determine the allowable leakage by the following formula.

$$L = 0.0002 \times D \times H^{1/2}$$

L = Allowable leakage, gallons per minute.

D = Depth of manhole from top to bottom, feet.

H = Head of water in feet as measured from the surface of the water in the manhole to the sewer line invert or to the prevailing ground water surface outside the manhole. The lesser height governs.

- g. If the leakage exceeds the allowable, determine the cause, take remedial action and re-test the manhole. If the leakage is less than the allowable and leaks are observed, repair the leaks.
2. Vacuum Test:
    - a. General: Test in accordance with ASTM C1244.
    - b. Test prior to backfilling around the manhole.
    - c. Test Preparation: Plug all lift holes and pipes entering or exiting the manhole.
    - d. Place test head inside the top section of the manhole's cone section and inflate in accordance with the manufacturer's instructions.
    - e. Draw a vacuum of 10 inches of mercury and shut the pump off.

- f. With the valve closed, the time for the vacuum to drop 9 inches shall be measured.
- g. The manhole shall pass the test if the time is greater than 60 seconds for a 48-inch diameter manhole, 75 seconds for a 60-inch diameter manhole and 90 seconds for a 72-inch diameter manhole.
- h. If the manhole fails the initial test, make necessary repairs with a non-shrink grout. Once the repair material has cured according to the manufacturer's recommendations the vacuum test shall be repeated. This process shall continue until a satisfactory test is obtained.
- i. All temporary plugs and braces shall be removed after each test.

## **G. DEFLECTION TESTING**

1. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.
2. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.
3. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.
4. Pull-Through Device:
  - a. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
    - 1) Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
    - 2) Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
  - b. Ball, cylinder, or circular sections shall conform to the following:
    - 1) A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
    - 2) A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
    - 3) Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
    - 4) Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
5. Pull-Through Device:
  - a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.

- b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.
- 6. Deflection measuring Device:
  - a. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
  - b. Obtain approval of deflection measuring device prior to use.
- 7. Deflection Measuring Device Procedure:
  - a. Measure deflections through each run of installed pipe.
  - b. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
  - c. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.
- 8. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1-year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

#### **H. CLEANING**

- 1. Thoroughly clean sewer lines and manholes of sediments, dirt, debris, and obstructions of any kind.

#### **I. TELEVISION INSPECTION**

- 1. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the sewer line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original disc and log sheets shall be provided to the Owner for review.
- 2. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
  - a. Low spot (1 inch or greater - mainlines only)
  - b. Joint separations (3/4 inch or greater opening between pipe sections)
  - c. Cocked joints present in straight runs or on the wrong side of pipe curves
  - d. Chips in pipe ends
  - e. Cracked or damaged pipe
  - f. Dropped joints
  - g. Infiltration
  - h. Debris or other foreign objects
  - i. Other obvious deficiencies
  - j. Irregular condition without logical explanation

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

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**SECTION 33 41 00**

**STORM UTILITY DRAINAGE PIPING**

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**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section Includes: Site storm drainage system up to five feet of any on-site building
- B. Related Sections:
  - 1. Section 31 21 00, Utility Trenching and Backfill
  - 2. Section 32 13 18, Cement and Concrete for Exterior Improvements
  - 3. Section 01 18 13 Sustainable Design Requirements
- C. Related Documents:
  - 1. City of Berkeley Standard Details
  - 2. City of Berkeley Resolution No. 62,693-N.S.: Adopting an Environmentally Preferable Purchasing Policy (EPP)
  - 3. AASHTO
    - a. M199: Precast Reinforced Concrete Manhole Sections
    - b. M252: Corrugated Polyethylene Drainage Pipe
  - 4. ASTM
    - a. A74: Cast Iron Soil Pipe and Fittings
    - b. A615: Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
    - c. C143: Standard Test Method for Slump of Hydraulic-Cement Concrete
    - d. C443: Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
    - e. C478: Circular Precast Reinforced Concrete Manhole Sections
    - f. C564: Rubber Gaskets for Cast Iron Soil Pipe and Fittings
    - g. C923: Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
    - h. C1173: Flexible Transition Couplings for Underground Piping Systems
    - i. D2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
    - j. D4101: Propylene Injection and Extrusion Materials
    - k. F477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe
  - 5. AWWA



- a. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. for Water
  - b. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - c. C115: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  - d. C116: Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
  - e. C150: Thickness design of Ductile Iron Pipe
  - f. C151: Ductile-Iron Pipe, Centrifugally Cast
  - g. C153: Ductile-Iron Compact Fittings
  - h. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe
  - i. M41: Ductile Iron Pipe and Fittings
6. Caltrans Standard Specifications, 2022
- a. Section 51, Concrete Structures
  - b. Section 52, Reinforcement
  - c. Section 70, Miscellaneous Drainage Facilities
  - d. Section 72, Slope Protection
  - e. Section 90, Concrete
7. Caltrans Standard Plans, 2022
- a. Plan D97A: Corrugated Metal Pipe Coupling Details No. 1, Annular Coupling Band Bar and Strap and Angle Connection
  - b. Plan D97C: Corrugated Metal Pipe Coupling Details No. 3, Helical and Universal Couplers
  - c. Plan D97D: Corrugated Metal Pipe Coupling Details No. 4, Hugger Coupling Bands
  - d. Plan D97E: Corrugated Metal Pipe Coupling Details No. 5, Standard Joint
  - e. Plan D97F: Corrugated Metal Pipe Coupling Details No. 6, Positive Joint
  - f. Plan D97G: Corrugated Metal Pipe Coupling Details No. 7, Downdrain

## 1.2 SUBMITTALS

- A. Follow submittal procedure outlined in Section 01 10 00, Supplemental General Requirements.
- B. Product data for the following:
  - 1. Piping materials and fittings
  - 2. Special pipe couplings
  - 3. Polymer-concrete, channel drainage systems (trench drains)
  - 4. Joint sealants
  - 5. Plastic area drains

6. Cleanout plugs or caps
  7. Precast concrete catch basins, inlets, curb inlets, junction structures and area drains, including frames and grates
  8. Precast clean out boxes and box covers
- C. Shop drawings: Include plans, elevations, details and attachments for the following:
1. Precast concrete manholes, frames and covers
- D. Design Mix Reports and Calculations: For each class of cast in place concrete
- E. Field Test Reports: Indicate and interpret test results for compliance with performance.

## **PART 2 - PRODUCTS**

### **3.1 PE PIPE AND FITTINGS (HDPE): 4 INCH THROUGH 10 INCHES**

- A. Pipe shall be in accordance with AASHTO M252 Type S, smooth interior and corrugated exterior
- B. Bell and spigot joints
- C. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F477
- D. Couplings: AASHTO M252, corrugated band type, engage a minimum of 4 corrugations, 2 on each side of pipe joint

### **3.2 PIPE ANCHORS**

- A. General: Location, configuration bearing area, etc. as indicated
- B. Portland Cement Concrete: See Section 32 13 18, Cement and Concrete for Exterior Improvements

### **3.3 PIPE CLEANOUTS**

- C. Piping: Same as storm drain line if possible
- D. Top Plug or Cap: Same material as piping if possible. Plug or cap to be secure but removable, threaded or non-threaded.
- E. Box Size: As required to provide access and allow easy removal and reinstallation of cap
- F. Box Types
  1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty
  2. Traffic Areas: Portland cement concrete box and box cover or steel or cast-iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading

- G. Box Cover Markings: "S.D.," unless otherwise specified
- H. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to the following:
  - 1. Associated Concrete Products, Inc.
  - 2. Brooks Products Inc.
  - 3. OldCastle Precast/Christy Concrete Products, Inc.

### 3.4 AREA DRAINS

- I. Grate and Riser: Area drain shall be as manufactured by Nyloplast or approved equal. Riser shall be constructed of 6-inch PVC SDR 35 piping per paragraph 2.1(A) of this section and connected to area drain by a gasket joint. Riser shall be vertical except as otherwise noted in the plans. Riser may include a reducer if necessary to make connection to the storm drain line.
- J. Elevation and Grading: Area Drain rim elevation shall be set and area around area drain shall be graded to drain away from any adjacent structures, walks, or roadways and towards area drain.

### 3.5 CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC.

- K. General: Size, shape, configuration, depth, etc. of structure and frame, grate, or cover shall be as indicated.
- L. Portland Cement Concrete and Reinforcing: See Section 32 13 18, Cement and Concrete for Exterior Improvements
- M. Precast Structure: Rate for AASHTO H20 loading in traffic areas.
- N. Steps: ASTM C 478 or AASHTO M199. Manufacture from deformed, ½ inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091).
- O. Frames, Grates and Covers: Caltrans Standard Specification Section 75-1.02, 75-1.02.B and 75-2
  - 1. Galvanize steel frames, grates and covers
  - 2. Grates and covers shall be non-rocking
  - 3. Rate for AASHTO H20 loading in traffic areas

### 3.6 MANHOLES

- P. Manholes shall be pre-cast concrete of the size and shape shown on the Plans and shall conform to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Caltrans Type I/II cement. Rate for AASHTO H20 loading in traffic areas.

- Q. All interior concrete surfaces shall be coated with “Xypex Crystalline” or approved equivalent. Use of a water-resistant admix is acceptable, at Contractor option.
- R. Frames and Covers: As indicated and in accordance with Caltrans Standard Specification Section 75-2.02B. Manhole covers shall have the words “STORM DRAIN” in letters not less than 2 inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.
- S. Frames and lids for manholes shall be match-marked in pairs before delivery to the job site. The lids shall fit into their frames without rocking.
- T. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Plans. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.
- U. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of Caltrans Standard Specifications Section 90 and as herein specified. The concrete shall be Class “A” containing six (6) sacks of portland cement per cubic yard of concrete. The grading of the combined aggregate shall conform with the CDT requirements of the three-quarter inch maximum. The consistency of the fresh aggregate shall be such that the slump does not exceed four inches, as determined by ASTM C143. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.
- V. Steps: ASTM C478 or AASHTO M199. Manufacture from deformed, ½ inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, or approved equal.

### 3.7 JOINT SEALANT FOR PRECAST STRUCTURES AND MANHOLES

- W. Mortar: Caltrans Standard Specification Section 51-1.02F
  - 1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.
- X. Gaskets: Preformed flexible rubber or plastic gasket
  - 1. Rubber Gaskets: ASTM C443
  - 2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is “Ram-Nek,” as manufactured by Henry Company, or approved equal.

### 3.8 PIPE TO STRUCTURE CONNECTOR/SEAL

- Y. A flexible pipe to manhole connector shall be used for all pipe penetrations to pre-cast and/or cast-in-place concrete structures.
  - 1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made

by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.

2. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C923. The connector and stainless-steel hardware shall meet or exceed the performance requirements proscribed in ASTM C923.
3. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
4. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

### 3.9 POLYMER-CONCRETE TRENCH DRAINS

Z. General: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total length required.

AA. Include the following components:

1. Channel Sections: Interlocking-joint, precast modular units with end caps. Inside width as indicated with deep, rounded bottom, with built in slope or flat invert as indicated and outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
2. Frame and Grate: Gray iron, ductile iron or galvanized steel as indicated. Where drain is located in traffic areas, rate for AASHTO H20 loading.

BB. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

CC. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. "Polydrain" by ABT Inc.
2. "ACO Drain" by ACO Polymer Products Inc.

## **PART 3 - EXECUTION**

### 3.1 PIPE INSTALLATION

- A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe.
- B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated on the City of Berkeley Standard Details.
- C. Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill

- D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with the manufacturer's recommendations.
- E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.
- F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.
- G. Closure: Close open ends of pipes and appurtenance at the end of each day's work or when work is not in progress.

### 3.2 SPECIAL PIPE COUPLINGS

- A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
- B. Installation: Manufacturers' instructions

### 3.3 INSTALLATION OF CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC. AND MANHOLES

- A. Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill
- B. Poured in Place Structures: Install as indicated and Caltrans Standard Specification Section 51.
  - 1. Shape bottoms to convey flows as indicated.
- C. Precast Structures: Install as indicated.
  - 1. Seal all joints and pipe entrances and exits.
  - 2. Place concrete in bottom and shape to convey flows as indicated.

### 3.4 POLYMER-CONCRETE TRENCH DRAIN INSTALLATION

- A. Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill

B. Install: As indicated and in accordance with the manufacturer's instructions.

### 3.5 CONCRETE/SHOTCRETE DITCH LINING PLACEMENT

A. Concrete/Shotcrete Slope Protection: Caltrans Standard Specification Section 72-5.03

### 3.6 POURED-IN-PLACE CONCRETE

A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of Caltrans Standard Specifications.

B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the Caltrans Standards Specifications. Unless otherwise noted herein or in the Plans, exposed surfaces of structures shall be Class 1 surface finish.

C. Curing shall conform to applicable portions in Section 90 of Caltrans Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.

D. Concrete shall not be cropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

### 3.7 PIPELINE FLUSHING

A. Newly constructed storm drain pipes shall be flushed with water to clean. A metal screen shall be used to collect and remove any rock, silt and other debris that is flushed out during cleaning.

### 3.8 DEFLECTION TESTING

A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.

B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.

C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.

D. Pull-Through Device:

1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.

a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.

b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.

2. Ball, cylinder, or circular sections shall conform to the following:
  - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
  - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
  - c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
  - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
3. Pull-Through Device:
  - a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
  - b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.

E. Deflection measuring Device:

1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
2. Obtain approval of deflection measuring device prior to use.

F. Deflection Measuring Device Procedure:

1. Measure deflections through each run of installed pipe.
2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

### 3.9 CLEANING

- A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

### 3.10 TELEVISION INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the drain line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original disc and log sheets shall be provided to the Owner for review.



- B. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
1. Low spot (1 inch or greater - mainlines only)
  2. Joint separations (3/4 inch or greater opening between pipe sections)
  3. Cocked joints present in straight runs or on the wrong side of pipe curves.
  4. Chips in pipe ends
  5. Cracked or damaged pipe
  6. Dropped joints
  7. Infiltration
  8. Debris or other foreign objects
  9. Other obvious deficiencies
  10. Irregular condition without logical explanation

**END OF SECTION**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX A  
FINISH AND MATERIALS SCHEDULE**

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

<b>INTERIOR FINISH AND MATERIALS SCHEDULE</b>				
<b>Item</b>	<b>Finish Schedule</b>	<b>Description</b>	<b>Color Designation</b>	<b>Location - See Finish Schedule for All Locations</b>
<b>FLOORS</b>				
<b>Sealed Concrete</b>				
	F1		Natural plain gray	Storage, Fire Riser Room, Electrical Rooms, Janitor Closet, Public Restrooms
<b>Polished Concrete</b>				
	F2		Natural plain gray	Lobby, Circulation
<b>Resilient - Linoleum</b>				
Forbo	F3	Marmoleum Striato	3573 Trace of Nature	Community Rooms, Office, Kitchen
<b>Ceramic Tile</b>				
Daltile	F4	Color Wheel Mosaics	Matte Architectural Gray 0109	Clubhouse Restrooms
<b>WALL BASE</b>				
<b>Rubber Base</b>				
Johnsonite	B1	4" Vulcanized rubber Wall Base	63 Burnt Umber	Storage, Fire Riser Room, Electrical Rooms, Janitor Closet, Office
<b>Ceramic Tile Base</b>				
Daltile	B2	4 x12 Flat Top Cove Base to match wall tile	Matt Arctic While 0790	Clubhouse Restrooms
<b>Wood Base</b>				
	B3	4" Solid Wood Base, Painted	See Paint Schedule	Lobby, Circulation, Community Rooms
<b>Integral Resilient Linoleum Base</b>				
Forbo	B4	4"; To match F3	To match F3	Kitchen
<b>Brake Metal Floor Base</b>				
	B5	0.04" Aluminum	Color to match storefront	Lobby: base at storefront as cladding over concrete curb
<b>WALLS</b>				
<b>Gypsum Wall Board</b>				
	W1		See Paint Schedule	Interior Walls

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

<b>Ceramic Tile</b>				
Daltile	W2	Color Wheel Linear 4 x 12	Matte Arctic White 0790	Clubhouse Restrooms
<b>CMU Block Wall</b>				
Basalite	W3	8x8x16 Ground Face, with High-Build Glazed Coating	225 Base Color	Public Restroom Building
<b>Horizontal Wood Siding</b>				
Buffalo Lumber	W4	Western Red Cedar, T&G, Smooth Finish, Painted	See Paint Schedule	Lobby
<b>FRP Wall Panels</b>				
Crane-Kemlite	W5	Glasboard with Surfaseal	White	Janitor Closet
<b>Plywood</b>				
	W6	½" Plywood		Storage
<b>Mirror over Gyp. Wall Bd.</b>				
	W7	Mirror with one-piece roll- formed stainless steel frame, ¾-inch x ¾-inch and ¼-inch thick mirror	Stainless Steel Frame and Mirror Glass	Clubhouse Restroom
<b>CEILINGS</b>				
<b>Panelized Linear Wood Ceiling</b>				
9Wood	C1	2100 Panelized Linear ¾" Depth x 3 ¼" Width @ 3 Members per Linear Foot (2114-3)	Western Hemlock	Lobby, Community Rooms, Exterior Soffit / Canopy as shown on RCP
<b>Gypsum Board</b>				
	C2		See Paint Schedule	See RCP
<b>T&amp;G</b>				
Buffalo Lumber	C4	Western Red Cedar	Clear Coat	Public Restrooms, Exterior Soffits as shown on RCP
<b>FURNISHINGS AND SPECIALTIES</b>				
<b>Countertops</b>				
Caesarstone		Quartz	Ocean Foam 6141	Community Rooms, Kitchen

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

<b>Plastic Laminate</b>				
Wilsonart		Plastic Laminate, Matte Finish, with Aeon Scratch Resistance and Anti-Microbial Protection	Fossil Shale D504-60	Community Rooms, Kitchen
<b>Melamine</b>				
			White	All Casework Interiors
<b>Window Shades</b>				
Mecho Shade		EcoVeil 1550 Series 3% open, UON	Eggshell 1566	Community Rooms, Office

APPENDIX CONTINUES ON NEXT PAGE

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

<b>EXTERIOR FINISH AND MATERIALS SCHEDULE</b>				
<b>Item</b>	<b>Finish Schedule</b>	<b>Description</b>	<b>Color Designation</b>	<b>Location - See Finish Schedule for All Locations</b>
<b>Aluminum Brake Metal</b>				
		Aluminum Coil	Dark bronze color to match storefront, see Paint Schedule	All Exterior Brake Metal Covers and Flashing, Exterior Metal Panels as shown in drawings
<b>Metal Panel</b>				
		Aluminum Panels		
<b>CMU Block</b>				
Basalite		8x8x16 Ground Face, Painted	225 Base Color with matte graffiti resistant coating	Public Restroom Building
<b>Horizontal Wood Siding</b>				
Buffalo Lumber		Western Red Cedar Wood Siding, T&G, Smooth Finish, Painted	See Paint Schedule	Building Exterior as Shown in Drawings
<b>Vertical Wood Siding</b>				
Buffalo Lumber		Western Red Cedar, Channel Rustic Lap Pattern, Rough Sawn, Painted	See Paint Schedule	Building Exterior as Shown in Drawings
<b>Acoustic Plaster</b>				
Pyrok		Acoustement 40 Spray-On Acoustic Plaster		Mechanical Well
<b>Exterior Storefronts</b>				
Kawneer		Trifab 451T Center Glazed w/ GlassVent Operable Window System	Dark Bronze Anodized	Storefront Mullions at Clubhouse
Kawneer		Trifab 400 Center Glazed	Dark Bronze Anodized	Storefront Mullions at Public Restrooms
<b>Exterior Glass</b>				
Insulated Glass Units, Clear		Solarban 72 on Starphire Glass, with Acid Etching on Surface 1	Low-E Coating	All Exterior Insulated Glass Units at Clubhouse UON
Single Light Glass, Translucent				All Exterior Glass at Public Restroom Building
<b>Folding Glass Storefront</b>				
Nanawall		SL-70	Dark Bronze	Community Room 103

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

			Anodized	
<b>Wood Trellis</b>				
		Western Red Cedar Trellis Members, Solid Stained	See Paint Schedule	Clubhouse North Entrance

<b>Wood Fence</b>				
Thermory		Timber Board, Thermory Benchmark Ash Series		Site Fencing, Trash Enclosure Fence

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX B  
PAINT SCHEDULE**



**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

<b>APPENDIX B PAINT SCHEDULE</b>			
<b>Number</b>	<b>Description</b>	<b>Color Designation</b>	<b>Location</b>
P-1	White	Benjamin Moore Atrium White OC-145	All gypsum board walls, soffits & ceilings U.O.N.
P-2	Dark Bronze	Benjamin Moore Midsummer Night 2134-20	Exposed structural steel (trash enclosure and public restroom building), handrails, guardrails, hollow metal doors and frames U.O.N., exterior metal panels, coping, flashing, louvers
P-3	Black	Benjamin Moore Space Black 2119-10	Conduit, wiring, ducts, piping, etc. above wood grille ceiling in Lobby and Community Rooms
P-4			Vertical siding
P-5			Horizontal siding
P-6	Red	Benjamin Moore Smoldering Red 2007-10	Lobby double doors
P-7			Interior doors and frames

END

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX C  
RESTROOM FIXTURES AND ACCESSORIES  
CUT SHEETS**



## Key Features

- Sophisticated design integrates a linear open concept
- Single piece cast design eliminates caulk lines and seams
- Basins available in polished Evero® Classic or Evero Matte cast quartz materials
- Standard system comes complete with mounting, access panel, drain assembly, and plumbing connections
- Available with WashBar® Duo in 6 PVD finishes
- Available with Verge™ deck-mounted soap dispensers and faucets in 6 PVD finishes

## Specifications

Accommodates one to two users at a time. The unit handles washroom traffic quickly and economically, while providing each user with personal space. The Verge Wash Basin is designed with standard lavatory spacing positioned on 30" centers and is available in Evero Classic - Geo Series or Pearl Series, or Evero Matte - Mason Series basin material.

## Product Compliance

### Listed by IAPMO R&T to

- Uniform Plumbing Code (UPC)
- National Plumbing Code of Canada
- International Plumbing Code (IPC)
- LVAD2 Evero Classic & Evero Matte: IGC 156 and the requirements of CSA B45.5/IAPMO Z124 and ASME A112.18.1/CSA B125.1
- LVAD2 Evero Matte: IGC 156 and the requirements of CSA B45.8/IAPMO Z403
- IGC 127 (WashBar)



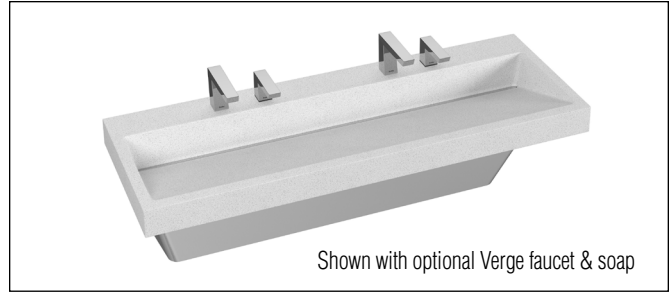
### Listed by UL Environment to

- GreenGuard Gold

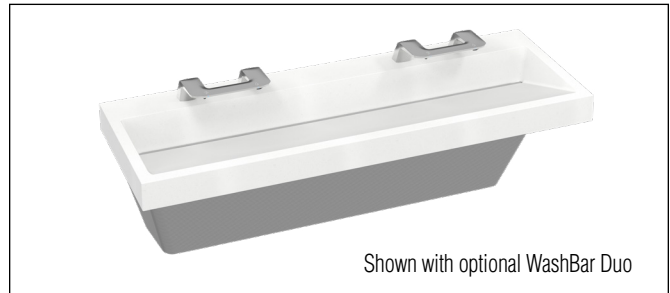


### Complies with

- ADA
- ICC/ANSI 117.1
- TAS
- NSF/ANSI 372



Shown with optional Verge faucet & soap



Shown with optional WashBar Duo

## Finishes

Click on any color swatch to view as a larger image.

- Polished Chrome
- Brushed Black Stainless\*
- Brushed Stainless\*
- Brushed Bronze\*
- Brushed Brass\*
- Brushed Nickel\*

\*PVD Finishes, see PVD Finishes section.

## \* PVD Finishes

Physical Vapor Deposition is an intricate, environmentally friendly finishing process that molecularly bonds the finish to the faucet, creating a very hard, durable surface that will not corrode, discolor, or tarnish.

## Compatible Bradley Products

- [Verge Coordinated Soap and Faucet](#)
- [WashBar Duo](#)

## Sustainability

- Evero Classic and Evero Matte participate in the mindful MATERIALS library



Serves the American Disabilities Act and ICC/ANSI 117.1 guidelines, citations 306, 308, 309.4, 606.4, 606.5 when installed according to these requirements. Consult local codes and standards.

This plumbing fixture is designed for hand washing only. It is not intended to dispense water for human consumption through drinking or for preparation of food or beverages.



# LVAD2 Verge® Wash Basin – LVA-Series

## Construction

### Basin

The basin has been designed to direct water to a trench drain and features a 300 series stainless steel drain cap. The basin is constructed of either the natural quartz surface Evero Classic - Geo or Pearl Series, or the natural stone-like quartz surface Evero Matte - Mason Series.

[Evero Classic - Geo Series](#) is a polished natural quartz surface made from a blend of bio-based resin, natural quartz, granite, and other exotic minerals.

[Evero Classic - Pearl Series](#) is a polished natural quartz surface made of bio-based resin, sea shells, and natural quartz.

[Evero Matte - Mason Series](#) is a matte natural stone-like quartz surface made from a blend of bio-based resin and a unique mixture of extra fine grade quartz.



Variations in the natural stone color, pattern, size, shape, and shade are inherent. Due to these unique characteristics, please expect subtle shade variations when units are installed adjacent to each other.

### Access Panel

Minimalistic panel is composed of decorative 300 series stainless steel or black, powder-coated stainless steel. Water supplies, valves, waste assembly, and other optional items are concealed within the panel. Select the enclosed bottom access panel for vandal-prone applications. The swing down access panel is designed to ease the maintenance process by eliminating tools and only requires one person for installation and access. Top edge of the access panel has been hemmed to reduce sharpness.

### Support Bracket

Bracket design allows for flexible stud or wall blocking anchor locations. Eliminates the need for in-wall carriers. IAPMO certified to meet or exceed ANSI load requirements.

### Faucet Options

Choose from our 0.35 gpm (1.30 Lpm), 0.05 gpc (0.25 Lpc) or 0.50 gpm (1.90 Lpm), 0.09 gpc (0.35 Lpc) Verge Faucets – Crestt, Metro, Linea, or Zen Series. Available in 0.35 gpm (1.30 Lpm), 0.05 gpc (0.25 Lpc) or 0.50 gpm (1.90 Lpm), 0.09 gpc (0.35 Lpc) WashBar Duo WBD1 includes soap dispenser and faucet in a single piece casting. Verge faucets and WashBar Duo come as chrome-plated with optional in-stock PVD finishes. Also available are 4" centerset and centershank faucet drillings for faucets by others.

### Soap Dispensers

Choose from our Verge Deck-Mounted Soap Dispensers – Crestt, Metro, Linea, or Zen Series. Also available with WashBar Duo WBD1, foam or liquid soap. WashBar Duo accommodates a 1 gallon cylindrical soap container, provided by others. Verge soap dispensers and WashBar Duo come as chrome-plated with optional in-stock PVD finishes. Soap drillings available for soap by others.

Please visit <https://www.bradleycorp.com/maintenance/soap-dispensers> for soap recommendations.

### Strainer and Drain Assembly System

Strainer and drain assembly system comes complete with 300 series stainless steel trench drain cap, tailpiece, and polypropylene P-trap. Optional chrome-plated P-trap available. Select the slotted drain cap with vandal-resistant screws for vandal-prone applications. The multi-station system is configured with one drain and one set of supplies to reduce the cost associated with individual drains.

<b>Models (Must select one)</b>					
Model	Description				
LVAD2	Verge Wash Basin – LVA-Series, Two-Station				
<b>Standard Selections (Must select one from each category)</b>					
<b>Country of Installation (select one)</b>					
C1	United States or Canada				
<b>Material Type (select one)</b>					
EC	Evero Classic – Polished Finish				
EM	Evero Matte – Matte Finish				
<b>Color of Evero® Bowl (select one)</b>					
<b>NOTE: Click on any swatch to view as a larger image.</b>					
<i>Evero Classic - Geo Series</i> <sup>1</sup>					
ANDORRA		Andorra	MOJAVE		Mojave
ANTARCTICA		Antarctica	MYKONOS		Mykonos
ARUBA		Aruba	PATAGONIA		Patagonia
BLACK-SEA		Black Sea	RAINIER		Rainier
DENALI		Denali	SIENA		Sienna
GLACIER		Glacier Bay	SIERRA		Sierra Madre
KALAHARI		Kalahari	YUKON		Yukon
<i>Evero Classic - Pearl Series</i> <sup>1</sup> (available at an additional charge)					
AKOYA		Akoya	BLACK-MOON		Black Moon
<i>Evero Matte - Mason Series</i> <sup>2</sup>					
BEDROCK		Bedrock	LUNAR GRAY		Lunar Gray
CINDER		Cinder	MESA WHITE		Mesa White
DESERT CLAY		Desert Clay	SANDBAR		Sandbar
LIMESTONE		Limestone			

- Available with Material Type EC only.
- Available with Material Type EM only.
- Available with Verge faucet selection only.
- Available with faucet drilling only.
- AC power supply will include either individual AC plug-in adapter or 4-way AC splitter assembly depending on configuration. Refer to the Verge Soap and Faucet Power Supply chart on page 4 for to learn what power supply the configurator will pull in.
- Available with Verge soap dispenser selection only.
- Available with soap dispenser drilling only.



# LVAD2

## Verge® Wash Basin – LVA-Series

<b>Standard Selections (continued)</b>	
<b>Faucet Type (select one)</b>	
<p><a href="#">WBD1</a> WashBar Duo (available with soap dispenser type WBD1 only)</p> <p><a href="#">S53-3100</a> Verge Faucet – Crestt Series</p> <p><a href="#">S53-3300</a> Verge Faucet – Metro Series</p> <p><a href="#">S53-3500</a> Verge Faucet – Linea Series</p> <p><a href="#">S53-3700</a> Verge Faucet – Zen Series</p> <p><a href="#">WBD1-DO</a> WashBar Duo Drilling Only</p> <p><b>4" Set</b> 4" Centerset (1¼" Drilling Only)</p> <p><b>SHANK</b> Centershank (1¼" Drilling Only)</p>	
<b>Faucet Activation Type (select one)</b>	
<p><b>R</b> Touch-Free Activation <sup>3</sup></p> <p><b>NONE</b> No Activation <sup>4</sup></p>	
<b>Water Supply Type (select one)</b>	
<p><b>T</b> Thermostatic Mixing Assembly (supply hoses and shut-offs included)</p> <p><b>L</b> Single Tempered Line Assembly (supply hoses and shut-offs included)</p>	
<b>Flow Control Type <sup>3</sup> (select one)</b>	
<p><b>3</b> 0.35 gpm Silicone Tip, Multiple Individual Laminar Flow Streams</p> <p><b>5</b> 0.50 gpm Silicone Tip, Multiple Individual Laminar Flow Streams</p>	
<b>Faucet Finish Type <sup>3</sup> (select one)</b>	
<p><b>PC</b> <input type="checkbox"/> Polished Chrome</p> <p><b>BB</b> <input type="checkbox"/> Brushed Black Stainless</p> <p><b>BS</b> <input type="checkbox"/> Brushed Stainless</p> <p><b>BZ</b> <input type="checkbox"/> Brushed Bronze</p> <p><b>BR</b> <input type="checkbox"/> Brushed Brass</p> <p><b>BN</b> <input type="checkbox"/> Brushed Nickel</p>	
<i>Trench drain cap will always have a stainless steel finish.</i>	
<b>Faucet Power Supply (select one)</b>	
<p><b>AC</b> AC Power <sup>3 5</sup></p> <p><b>BA</b> Battery – 4x AA alkaline batteries included per faucet <sup>3</sup></p> <p><b>NONE</b> No Power Supply <sup>4</sup></p>	
<b>Soap Dispenser Type (select one)</b>	
<p><a href="#">WBD1</a> WashBar Duo (available with faucet type WBD1 only)</p> <p><a href="#">6-3100</a> Verge Deck-Mounted Soap Dispenser – Crestt Series <sup>3</sup></p> <p><a href="#">6-3300</a> Verge Deck-Mounted Soap Dispenser – Metro Series <sup>3</sup></p> <p><a href="#">6-3500</a> Verge Deck-Mounted Soap Dispenser – Linea Series <sup>3</sup></p> <p><a href="#">6-3700</a> Verge Deck-Mounted Soap Dispenser – Zen Series <sup>3</sup></p> <p><a href="#">WBD1-DO</a> WashBar Duo Drilling Only</p> <p><b>SDO</b> 1-3/8" Soap Drilling Only</p> <p><b>NSD</b> No Soap Dispenser/No Drilling</p>	
<b>Soap Activation Type (select one)</b>	
<p><b>R</b> Touch-Free Activation <sup>6</sup></p> <p><b>NONE</b> No Activation <sup>7</sup></p>	

<b>Soap Type (select one)</b>	
<p><b>F</b> Foam Soap</p> <p><b>L</b> Liquid Soap</p>	
<b>Soap Fill System <sup>6</sup> (select one)</b>	
<p><b>T</b> Single (top fill at spout)</p>	
<b>Soap Dispenser Finish Type (select one)</b>	
<p><b>PC</b> <input type="checkbox"/> Polished Chrome</p> <p><b>BB</b> <input type="checkbox"/> Brushed Black Stainless</p> <p><b>BS</b> <input type="checkbox"/> Brushed Stainless</p> <p><b>BZ</b> <input type="checkbox"/> Brushed Bronze</p> <p><b>BR</b> <input type="checkbox"/> Brushed Brass</p> <p><b>BN</b> <input type="checkbox"/> Brushed Nickel</p>	
<b>Soap Power Supply (select one)</b>	
<p><b>AC</b> AC Power <sup>5 6</sup></p> <p><b>BA</b> Battery – 4x D-cell batteries included per dispenser <sup>6</sup></p> <p><b>NONE</b> No Power Supply <sup>7</sup></p>	
<b>Trench Drain Cap Type (select one)</b>	
<p><b>DR1</b> Stainless Steel Trench Drain Cap</p> <p><b>DR2</b> Slotted Stainless Steel Trench Drain Cap w/ Vandal Screws</p>	
<i>Trench drain cap will always have a stainless steel finish.</i>	
<b>Access Panel Type (select one)</b>	
<p><b>STAIN</b> Swing Down Stainless Steel</p> <p><b>STAIN-E</b> Swing Down Stainless Steel w/Enclosed Bottom</p> <p><b>PWB</b> Swing Down Matte Black Powder-Coated Stainless Steel</p> <p><b>PWB-E</b> Swing Down Matte Black Powder-Coated Stainless Steel w/Enclosed Bottom</p>	
<b>Access Panel Fastener Type (select one)</b>	
<p><b>TS</b> Thumb Screw</p> <p><b>VS</b> Vandal Resistant Screw</p> <p><b>CL</b> Cam Lock</p>	
<b>Waste Assembly Type (select one)</b>	
<p><b>S-POLY</b> Single Polypropylene P-Trap</p> <p><b>S-CHROME</b> Single Chrome-Plated P-Trap</p>	

- <sup>1</sup> Available with Material Type EC only.
- <sup>2</sup> Available with Material Type EM only.
- <sup>3</sup> Available with Verge faucet selection only.
- <sup>4</sup> Available with faucet drilling only.
- <sup>5</sup> AC power supply will include either individual AC plug-in adapter or 4-way AC splitter assembly depending on configuration. Refer to the Verge Soap and Faucet Power Supply chart on page 4 for to learn what power supply the configurator will pull in.
- <sup>6</sup> Available with Verge soap dispenser selection only.
- <sup>7</sup> Available with soap dispenser drilling only.



**Verge Soap and Faucet Power Supply**

	<b>1-Station</b>	<b>2-Station</b>	<b>3-Station</b>
<b>Faucet Only</b>	AC Adapter X 1 1 duplex outlet required	AC Adapter X 2 1 duplex outlet required	AC Splitter X 1 1 duplex outlet required
<b>Soap Only</b>	AC Adapter X 1 1 duplex outlet required	AC Adapter X 1 1 duplex outlet required	AC Splitter X 1 1 duplex outlet required
<b>Faucet &amp; Soap</b>	AC Adapter X 2 1 duplex outlet required	AC Adapter X 1 1 duplex outlet required	AC Splitter X 2 1 duplex outlet required
<b>Soap &amp; Multi-Feed</b>	NA	NA	AC Splitter X 1 1 duplex outlet required
<b>Faucet, Soap, &amp; Multi-Feed</b>	NA	NA	AC Splitter X 2 1 duplex outlet required

Note: AC power supply will include either individual AC plug-in adapter OR 4-way splitter assembly depending on the configuration.



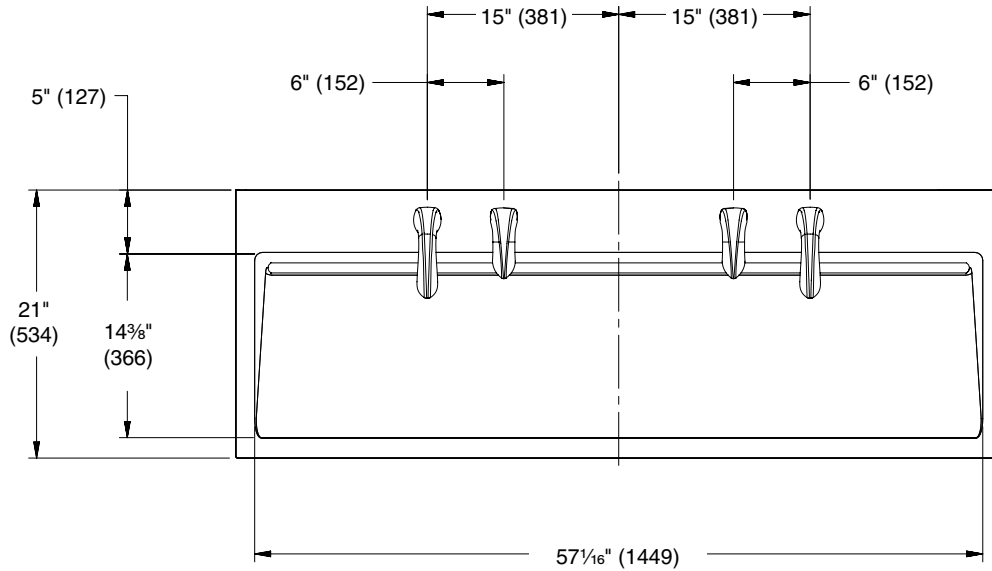
# LVAD2 Verge® Wash Basin – LVA-Series

## Dimensions for LVAD2 Verge Wash Basin (Shown with Crestt Series Faucet and Soap)

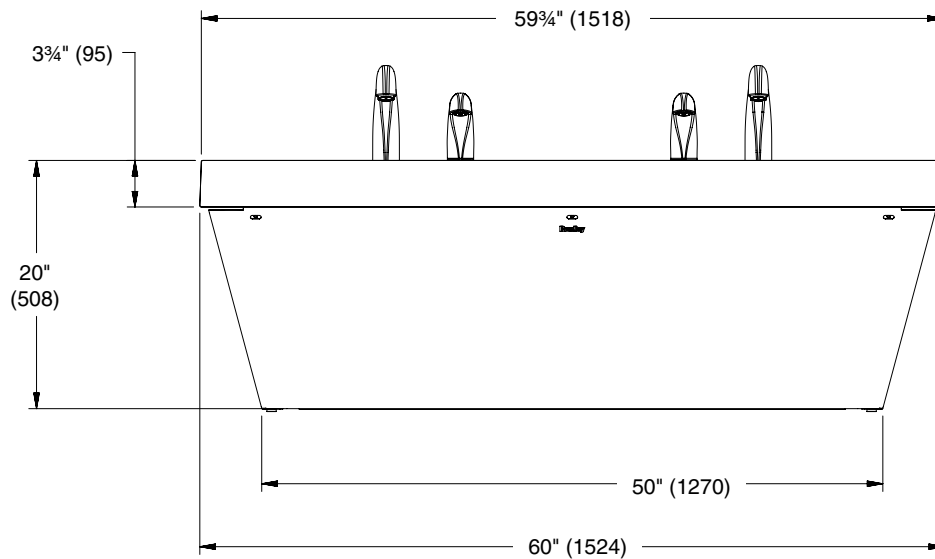
(mm)

For dimensional views of the LVAD2 Verge Wash Basin with WashBar Duo, reference [WashBar Duo WBD1 tech data](#).

### Top View



### Front View



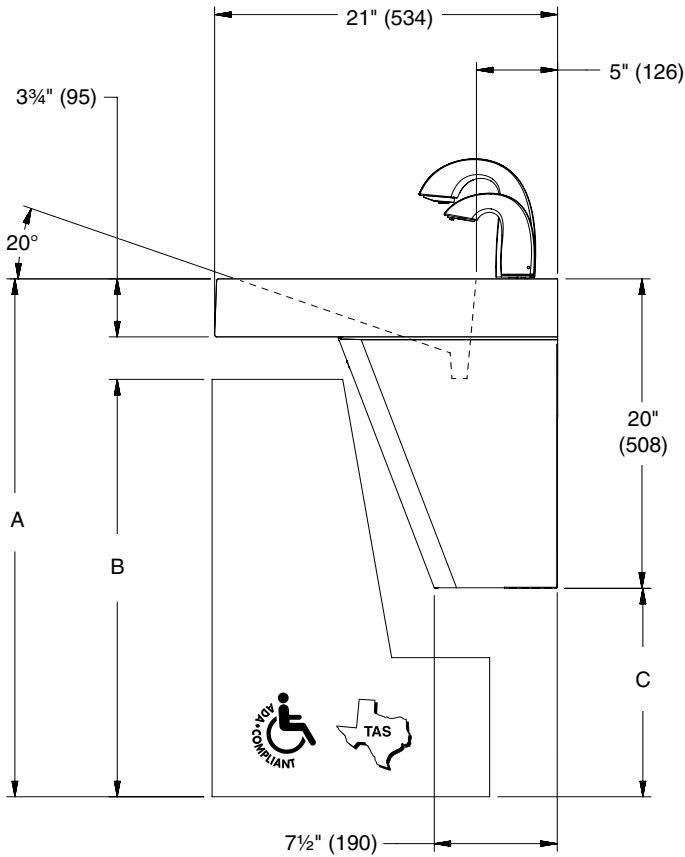


# LVAD2 Verge® Wash Basin – LVA-Series

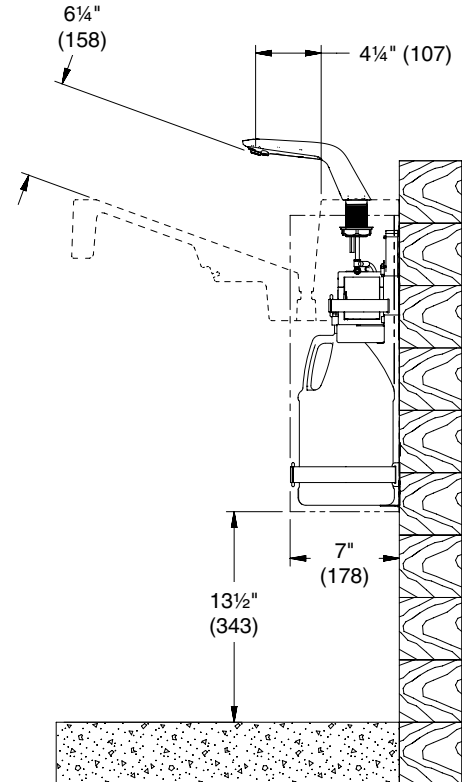
## Dimensions for LVAD2 Verge Wash Basin

(mm)

Side View with Faucet



Side View with WashBar Duo



	ADA/TAS Standard Height	ADA/TAS Juvenile Height (Children 6-12 years)	CSA Standard Height
<b>Dim A</b>	33½" (851)	30½" (775)	33½" (851)
<b>Dim B</b>	27" (686)	24" (610)	29 <sup>29</sup> / <sub>32</sub> " (760)
<b>Dim C</b>	13½" (343)	10½" (267)	13½" (536)
<b>Notes</b>	At least one basin must meet the dimensional requirements and have proper reach, knee, and toe clearance	At least one basin must meet the dimensional requirements and have proper reach, knee, and toe clearance	





## Penal-Ware® 1652 Series

### 18" Lavatory with Oval Bowl - ADA 2010 Compliant



1652-1-BP-04-M

Fixture May Show Some Available Options

Please visit [www.acorneng.com](http://www.acorneng.com) for most current specifications.

## 18" Lavatory with Oval Bowl - ADA 2010 Compliant

**Fixture** is designed to be installed on a finished wall and serviced from an accessible pipe chase. Optional Wall Sleeve or Metal Template is recommended for all installations for required wall openings. Lavatory complies with ANSI, UFAS, CBC and ADA 2010 requirements for accessibility. Compliance is subject to the interpretation and requirements of the local code authority.

**Cabinet** is fabricated from 14 gage, type 304 stainless steel and is seamless welded construction with exposed surfaces polished to a satin finish. Cabinet interior is sound-deadened with fire-resistant material. There are no accessible voids or crevices where contraband can be concealed.

**Lavatory Oval Bowl** is 14-3/4" x 9-1/2" x 4-1/2" deep and includes an integral fast drain. Standard elbow waste outlet is 1-1/2" O.D. plain end and extends 11" beyond the fixture to be field trimmed to fit by installer.

**Optional Lavatory Valve** is an pneumatically operated, pushbutton Air-Control valve using atmospheric air. Pushbutton is vandal-resistant and requires less than 5 pounds to activate valve. Valve is metering, non-hold open type. Valve timing is adjustable from 5 to 60 seconds. Valve includes a 0.5 GPM flow control and can be remotely located up to 10 feet from the operating pushbutton. Valve and Bubbler conforms with lead free requirements of NSF61, Section 9 and CHSC 116875.

**Regularly furnished** items include a fast drain, an integral self-draining soap dish and mounting hardware for walls up to 8" thick.

**Suffix Option -DMB, Deck Mounted Bubbler** optionally available, provides a drinking bubbler that meets ADA requirements and lead free requirements of NSF61, Section 9 and CHSC 116875. This option also includes a separate pushbutton and non-metering Air-Control valve with .7 GPM flow control.

### GUIDE SPECIFICATION

Provide and install an Acorn Penal-Ware, 18" wide ADA 2010 Compliant Lavatory with Oval Bowl (specify model number and options). Unit shall conform with ANSI, UFAS, CBC and ADA requirements for accessibility. Fixture shall be fabricated from 14 gage, type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Countertop shall have an air-circulating, self-draining soap dish. Provide Air-Control pneumatically operated, metering, non-hold open valve with ADA compliant pushbutton. Valve and Bubbler conform with lead free requirements of NSF61, Section 9 and CHSC 116875. Cabinet interior shall be sound deadened with fire-resistant material. Fixture shall be furnished with necessary fasteners to complete installation.



# LVAD2 Verge® Wash Basin – LVA-Series

## Rough-Ins for LVAD2 Verge Wash Basin

(mm)

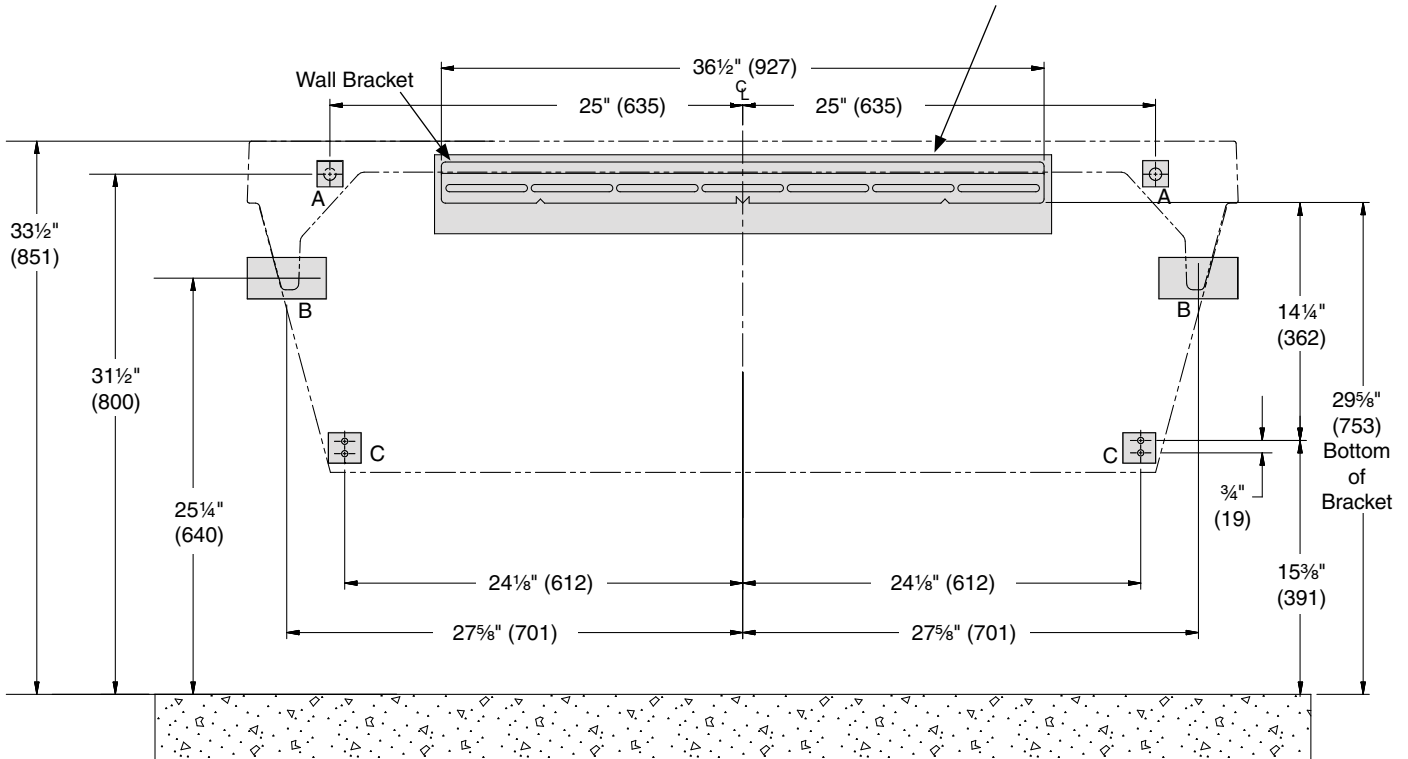
For rough-in information for LVAD2 Verge Wash Basin with WashBar Duo, reference [WashBar Duo WBD1 tech data](#).

**⚠ WARNING** Ensure bowl is completely seated in the wall bracket and securely fastened to the wall at point A.

Mounting for Standard, ADA, and TAS height shown.

Points A, B, and C require sufficient backing compliant with local building codes.

Secure bracket to wall using min. (2) 3/8" anchor bolts to the left of C/L and min. (2) 3/8" anchor bolts to the right of C/L. The (2) anchor bolts to the right of C/L must be min. 16" apart from the anchor bolts to the left of C/L. When mounting is complete, check to ensure the bracket is level. See Step 1: Bracket Mounting for more information.



CODE	DESCRIPTION	QTY.
A	Install (1) 3/8" wall anchor with a minimum pull-out force of 1,000 lb per local codes at locations shown.	2
B	Provide structural backing compliant with local building codes.	2
C	Install wall anchor with a minimum pull-out force of 100 lb per local codes at locations shown.	4

RIM HEIGHT	VERTICAL HEIGHT ADJUSTMENTS	FIXTURE STYLE
33 1/2"	No Adjustment	Standard Height, ADA, TAS, and CSA
30 1/2"	Subtract 3"	Juvenile, ADA, and TAS

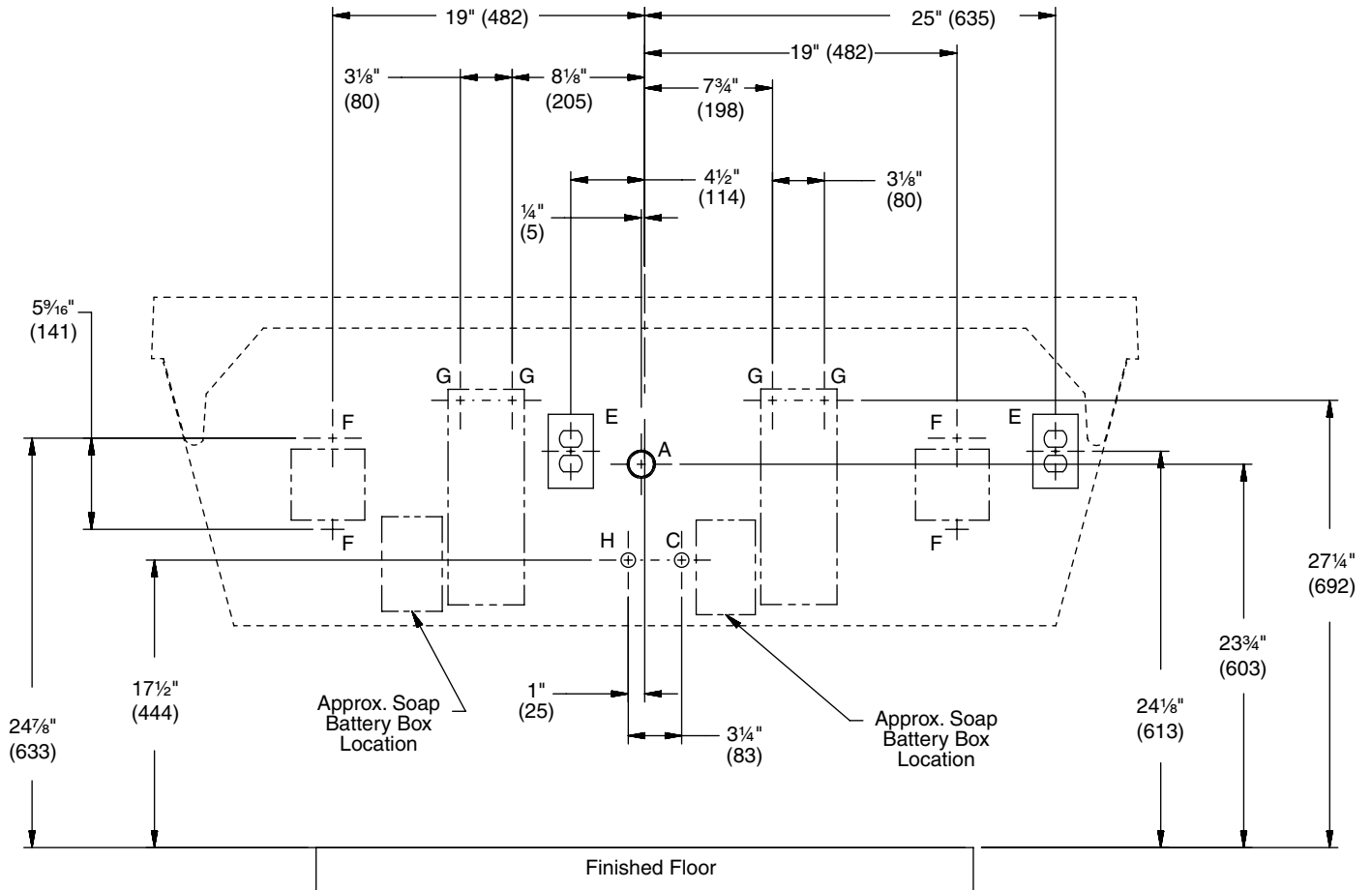


# LVAD2 Verge® Wash Basin – LVA-Series

## Plumbing & Electrical Rough-Ins for LVAD2 Verge Wash Basin

(mm)

Mounting for Standard, ADA, and TAS height shown.



CODE	DESCRIPTION	QTY.
A	1 1/2" NPT Drain, Stub-out 2" from wall	1
H,C	1/2" Nominal (7/8" O.D. Comp.) Hot/Cold supplies, Stub-out 2" from wall	1
E	110V GFI protected electrical outlet WashBar Duo requires 120V AC, GFCI outlet properly grounded	2
F	#10 Anchors for Faucet Control Box Installation	4
G	#10 Anchors for Soap Tank Installation	4



# Penal-Ware® 1652: 18" Lavatory with Oval Bowl - ADA Compliant

### WALL THICKNESS AND TYPE (Must Specify)

Thickness: \_\_\_\_\_ Type:  Concrete  Block  Steel

### MODEL AND OPTIONS SELECTION:

#### BASE MODEL NUMBER

1652 18" Lavatory with Oval Bowl - ADA Compliant

### FIXTURE MOUNTING AND WASTE (Must Specify)

-1 Off-Floor, Wall Outlet

### BUBBLER SELECTION (Must Specify)

-BC Bubbler, Code  
 -BP Bubbler, Penal  
 -BPH Hemispherical Penal Bubbler  
 -LF Lav-Filler

### VALVE SELECTION (Must Specify)

#### Air-Control (Pneumatic)

-03-M Single Temp, Metering  
 -04-M Hot & Cold, Metering

#### Master-Trol® (Electronic)

-EVS1 Single Temp  
 -EVS2 Hot & Cold  
 -EVSP1 Single Temp, Piezo Button  
 -EVSP2 Hot & Cold, Piezo Buttons

#### Master-Trol® PLUS (Electronic)

-MTP1 Single Temp  
 -MTP2 Hot & Cold  
 -MTPP1 Single Temp, Piezo Button  
 -MTPP2 Hot & Cold, Piezo Buttons

#### -MTP VALVE OPTION

-PFB Power Failure Bypass (Provides drinking water in the event of power failure)

#### Time-Trol® (Electronic)

-MVC1 Single Temp  
 -MVC1-BAT Single Temp Battery Powered (Batteries Not Included)  
 -MVC2 Hot & Cold  
 -MVC2-BAT Hot & Cold Battery Powered (Batteries Not Included)

#### Programmable (Electronic) w/9VDC Plug-In Transformer

-PPZ1 Single Temp Programmable Piezo Button  
 -PPZ2 Hot & Cold Programmable Piezo Button

#### Valve By Others

-9 Punched for Valve by Others

### VALVE OPTIONS

-BRS Brass Body Valve  
 -CI Cycle Interrupt for Time-Trol® Valves  
 -MA2 Manifoldd, 2-Stack  
 -MA3 Manifoldd, 3-Stack (N/A with -PFB option)  
 -MA4 Manifoldd, 4-Stack (N/A with -PFB option)  
 -PBH Hemispherical Pushbutton  
 -TF Transformer, 120VAC to 24VAC (-MVC option only)

### CABINET OPTIONS

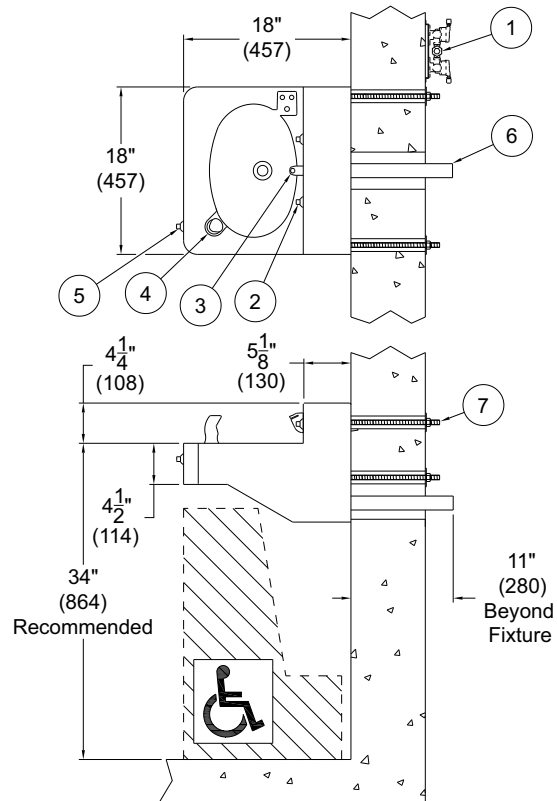
-FMT Fixture Mounted Trim  
 -TB Toothbrush Holder  Left  Right  
 -TG 12 Gage Cabinet  
 -TH Towel Hook  Single  Double  Left  Right

### LAVATORY WASTE OPTIONS

-LW1 Thru-Wall Waste Extension with P-Trap  
 -LWE Lavy Waste Extension (11" Standard) Specify Length Beyond Fixture: \_\_\_\_\_  
 -OF Lavatory Overflow

### PRODUCT OPTIONS

-DMB Deck Mounted Drinking Bubbler (Cold water only) N/A with -03-M tempered supply  
 -BP Penal Style  -BC Code Style  
 -BPH Penal Hemispherical Style  
 -EG Enviro-Glaze, Specify Color: \_\_\_\_\_  
 -MT Metal Template (Only 1 Required Per Project)  
 -SW Wall Sleeve  
 -VAC AcornVac System



1652ADA-1-BP-04-DMB

- NOTES:
- 04 Air-Control Valve
  - Lavy Valve Pushbuttons
  - Lavy Bubbler
  - Optional -DMB Deck Mounted Bubbler
  - Pushbutton for option -DMB
  - Lavy Waste Outlet, Extended 11" Beyond Fixture
  - Wall Mounting Hardware

Please visit [www.acorneng.com](http://www.acorneng.com) for most current specifications.

**WARNING:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

<p><b>Important:</b> Installation instructions and current rough-in are furnished with each fixture. Do not rough in without certified dimensions. Dimensions are subject to manufacturer's tolerance of plus or minus 1/4" and change without notice. Acorn assumes no responsibility for use of void or superseded data. © Copyright 2009 Acorn Engineering Company</p>	
<p>Selection Summary</p> <p>Model No. &amp; Option _____</p> <p>Quantity _____</p>	<p>Approved for Manufacturing</p> <p>Company _____ Title _____</p> <p>Signature _____ Date _____</p>

**Afwall® Millenium™ FloWise® 1.28 GPF  
Flushometer Toilet System with EverClean®**

- 3351.528** 1.28 gpf Exposed Top Spud Bowl and Selectronic® Flush Valve

**BOWL:**

- Wall-mounted elongated flushometer valve toilet
- Vitreous china
- High Efficiency. Operates in the range of 1.1 gpf to 1.6 gpf (4.2 Lpf to 6.0 Lpf)
- Permanent EverClean® surface inhibits the growth of stain and odor-causing bacteria, mold, and mildew on the surface
- Condensation channel
- Powerful direct-fed siphon jet action
- 1-1/2" inlet spud
- Fully-glazed 2-1/8" trapway
- 10" x 12" water surface area
- 100% factory flush tested
- Bolt caps and seat not included
- Model 3351.101

**SELECTRONIC® FLUSH VALVE:**

- Factory-Installed CR-P2 Lithium Battery
- Self-Cleaning Piston with integral wiper spring significantly reduces clogging and maintenance
- Selectronic® Proximity System with universal sensor provides hygienic, "hands free" operation
- State-of-the-Art Electronics prevent ghost flushing
- Dezincification Resistant semi-red brass alloy
- Fully Mechanical Manual Override Button can flush the valve without power
- Fail-Safe: Valve automatically closes upon loss of power or water pressure and does not need to be reset
- Adjustable Sanitary Flush cleans the fixture & maintains the trap seal.
- Chemical Resistant EPDM Seals for extended life
- Adjustable Tailpiece for rough-in flexibility
- Can be installed left or right handed
- Model 6065.121

**Includes:**

- 047007-0070A Inlet Spud (furnished with bowl)
- 1" I.P.S. angle stop with back-flow protection and vandal resistant cap
- 1" Sweat solder kit including cover tube and wall flange
- 1-1/2" High back pressure vacuum breaker, spud coupling and flange

**To Be Specified:**

- Color:  White
- Seat:
  - American Standard #5901.100 Heavy duty open front less cover
  - American Standard #5905.100 Extra heavy duty open front less cover



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

**High-Efficiency Toilet Systems:**

- 20% water savings when compared to a 1.6 gpf toilet system

**System MaP\* Score:**

- 1,000 grams of miso @ 1.28 gpf

\* Maximum Performance (MaP) testing performed by IAPMO R&T Lab. MaP Report conducted by Veritec Consulting, Inc. and Koeller and Company.

**BATTERY LIFE:**

- 4 years @ 4,000 flushes per month

**Operating Pressure:**

25 psi (flowing) - 80 psi (static)

**Flow Requirement:**

25gpm (94.6 L/min.)

**Nominal Fixture Dimensions:**

660 x 356 x 381mm (26" x 14" x 15")



5-YEAR LIMITED WARRANTY on FIXTURE and FLUSH VALVE



EVERCLEAN



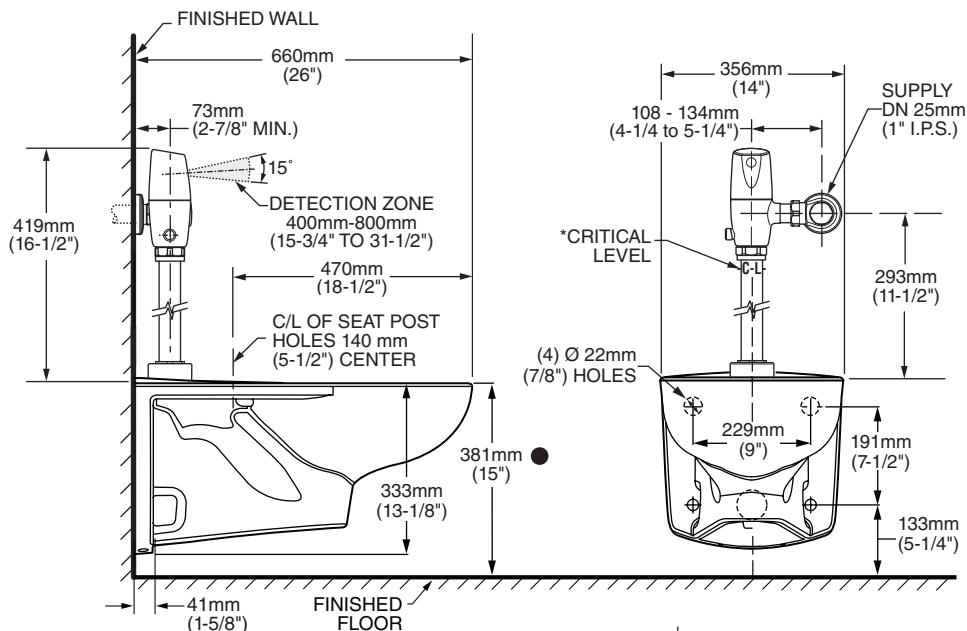
EPA WATERSENSE CERTIFIED

**Fixture Compliance Certifications -  
 Meets or Exceeds the Following  
 Specifications:**

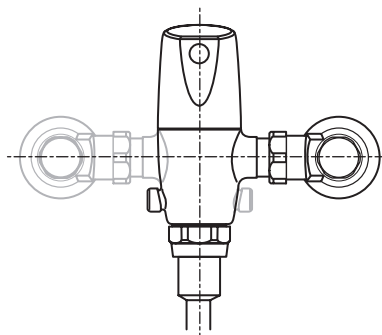
- ASME A112.19.2-2008 / CSA B45.1-08  
 for Vitreous China Fixtures

**Valve Listings:**

- ASSE 1037
- ANSI/ASME A112.19.2
- ADA Compliant



\*Note: The Critical Line (-C-L-) on Vacuum Breaker must typically be a minimum of 6" (152mm) above fixture. Consult Codes for details.



VALVE LEFT or RIGHT HAND INSTALLATION



**MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES  
 AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND  
 FACILITIES - CHECK LOCAL CODES.**

- When installed so that top of seat is 432 to 483mm (17" to 19") from the finished floor.

**NOTES:**

**WASTE OUTLET SEAL RING MUST BE NEOPRENE OR GRAPHITE-FELT (WAX RING NOT RECOMMENDED).**

SUGGESTED 2mm (1/16) CLEARANCE BETWEEN FACE OF WALL AND BACK OF BOWL. TO COMPLY WITH AREA CODE GOVERNING THE HEIGHT OF VACUUM BREAKER ON THE FLUSHOMETER VALVE, THE PLUMBER MUST VERIFY DIMENSIONS SHOWN FOR SUPPLY ROUGHING.

CARRIER FITTING AS REQUIRED TO BE FURNISHED BY OTHERS. PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORT.

**IMPORTANT:** Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages



## Penal-Ware® 1680 Series

Siphon Jet Toilet - Off-Floor



1680-W-1

Fixture May Show Some Available Options



Please visit [www.acorneng.com](http://www.acorneng.com) for most current specifications.

### Siphon Jet Toilet - Off-Floor

**Fixture** is arranged to be installed on finished wall and serviced from an accessible pipe chase. Optional Wall Sleeve or Metal Template is recommended for all installations for required wall openings. Toilet bowl is fabricated from 14 gauge, type 304 stainless steel and is seamless welded construction. Housing flange is structurally reinforced and is sound-deadened with fire-resistant material. Exterior is polished to a satin finish. The inside of the toilet bowl also has a satin finish. There are no accessible voids or crevices where contraband can be concealed.

**Toilet** is a siphon jet type with an elongated bowl manufactured to ASME A112.19.3 and CSA B45.4 requirements and will flush with a minimum of 25 PSI flow pressure when used in conjunction with a minimum of 1.28 GPF. Trap has a minimum 3-1/2" seal and will pass a 2-1/8" ball. Toilet waste outlet is 2-3/8" diameter plain end extending 3" beyond the back of the fixture.

**Regularly Furnished** items include mounting hardware for walls up to 8" thick.

#### GUIDE SPECIFICATION

Provide and install Acorn Penal-Ware Siphon Jet Toilet (specify model number and options). Toilet bowl shall be fabricated from 14 gauge, type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Toilet shall be concealed siphon jet type with an elongated bowl, a self-draining flushing rim, and an integral contoured seat. Toilet shall meet ASME A112.19.3 and CSA B45.4 requirements and will flush with a minimum of 25 PSI flow pressure when used in conjunction with a minimum of 1.28 GPF. Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Fixture shall withstand loadings of 3,000 pounds without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.





# Penal-Ware®: 1680 Siphon Jet Toilet - Off-Floor

## WALL THICKNESS AND TYPE (Must Specify)

Thickness: \_\_\_\_\_ Type:  Concrete  Block  Steel

## MODEL NUMBER AND OPTIONS SELECTION:

### BASE MODEL NUMBER

1680 Siphon Jet Toilet

### SUPPLY (Must Specify)

-T Top (Exposed)  
 -W Wall (Concealed)

### FIXTURE MOUNTING AND WASTE (Must Specify)

-1 Off-Floor, Wall Outlet

### FLUSH VALVE GPFs (Must Specify)

-1.28 GPF (HET)  
 -1.6 GPF (Not Available in California)  
 -3.5 GPF (Not Available in California)

### FLUSH VALVE OPTIONS (Must Specify)

**\*NOTE: FOR FLUSH VALVE ACCESS PANEL OR COVER REFER TO ACORN OPTIONS MODEL #2898 (-W SUPPLY) OR # 2802 (-T SUPPLY).**

- EVSFV Master-Trol® Electronic Flush Valve (N/A for Top Supply)
- EVSPFV Master-Trol® Electronic Flush Valve w/ Piezo Button (N/A for Top Supply)
- FV Flush Valve, Mechanical (N/A for ADA)
- FVBO Flush Valve by Others
- FVH Flush Valve, Hydraulic (N/A for Top Supply)
- FVL Flush Valve, Lever Handle (Wall Supply)
- MTPFV Master-Trol® PLUS Electronic Flush Valve (N/A for Top Supply)
- MTPPFV Master-Trol® PLUS Electronic Flush Valve w/ Piezo Button (N/A for Top Supply)
- MVCFV Time-Trol® Electronic Flush Valve (N/A for Top Supply)

## TOILET SEAT OPTIONS

- HPS High Polish Integral Seat
- HS Hinged Seat (N/A with #2802 Flush Valve Cover)
- PFS Punched for Seat by Others

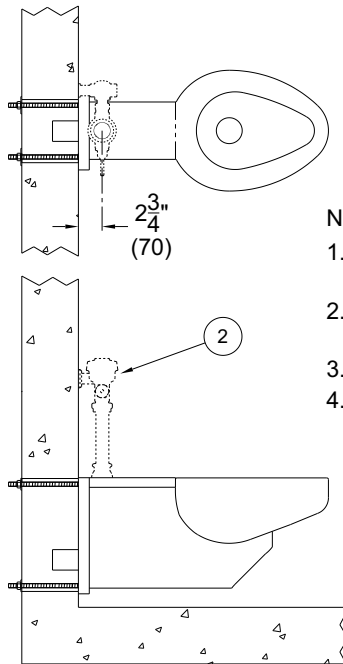
## TOILET OPTIONS

- CO1 Cleanout w/ O-Ring Connecting to No-Hub 4" (Plain End Only)
- CO1-3 Cleanout w/ O-Ring Connecting to No-Hub 3" (Plain End Only, N/A with -WO3)
- COH Cleanout Hook Assembly
- FT Flood-Trol (N/A with Top Supply)
- FTA Flood-Trol Auto-Reset (N/A with Top Supply)
- FTE Flood-Trol Electronic
- FVT Flush Thru Wall Connector
- GW Gasketed Toilet Waste
- PC Pinned Cleanout Plug (For -CO1 Options above)
- TG 12 Gauge Housing
- TSC Toilet Shipping Cover
- TWE Toilet Waste Extension (3" Standard) Specify Length Beyond Fixture: \_\_\_\_\_
- WO3B 3" Bell Waste Outlet w/ Std. 2-3/8" Trap

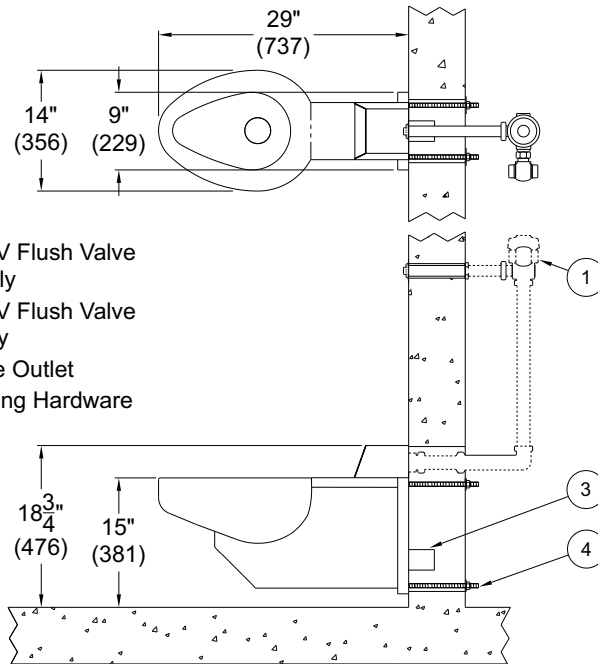
## PRODUCT OPTIONS

- ADA 18" Integral Seat Height
- EGE Enviro-Glaze Color Specify: \_\_\_\_\_
- Toilet Exterior Only
- MT Metal Template (Only 1 Required Per Project)
- SW Wall Sleeve
- TF Transformer, 120VAC to 24VAC (-MVCFV option)
- VAC AcornVac System

Please visit [www.acorneng.com](http://www.acorneng.com) for most current specifications.



1680-T-1



1680-W-1

### NOTES:

1. Optional -FV Flush Valve - Wall Supply
2. Optional -FV Flush Valve - Top Supply
3. Toilet Waste Outlet
4. Wall Mounting Hardware

**WARNING:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

<p><b>Important:</b> Installation instructions and current rough-in are furnished with each fixture. Do not rough in without certified dimensions. Dimensions are subject to manufacturer's tolerance of plus or minus 1/4" and change without notice. Acorn assumes no responsibility for use of void or superseded data. © Copyright 2009 Acorn Engineering Company</p>	
<p style="text-align: center;">Selection Summary</p> <p>Model No. &amp; Option _____</p> <p>Quantity _____</p>	<p style="text-align: center;">Approved for Manufacturing</p> <p>Company _____ Title _____</p> <p>Signature _____ Date _____</p>





### Metro Series Features - Faucet and Soap

- Refined, cylindrical design pairs with Verge™ soap model 6-3300
- Matching faucet and soap designs that integrate seamlessly with Bradley lavatories\*\*
- Chrome-plated cast brass construction with optional in-stock PVD finishes\*
- Sensing optimized to eliminate false activations and maximize battery life
- Vandal-resistant construction includes concealed sensor package, durable PVD finish options, and rotation-resistant locking nut
- Patents Pending

### Faucet Key Features

- Touch-free dual-sensor activation
- Multiple low flow laminar options
- Spout reach designed to optimize handwashing space
- Battery standard or optional AC plug-in adapter with battery backup
- Centershank, rotation-resistant locking nut
- Low battery LED indicator with sensor package
- Consistent parts platform across all Verge faucet designs
- Cast brass spout construction with durable, environmentally-friendly finishes\*

### Specification

Refined, cylindrical design pairs with soap model 6-3300 and integrates seamlessly with Bradley lavatories\*\*. Touch-free, dual-sensor activation with time of flight and diffuse reflective sensors that work in tandem to detect and confirm the user's presence, eliminating false activations. Battery pack standard or optional AC adapter with battery back-up. Faucet shall feature chrome-plated cast brass construction with optional in-stock PVD finish. Low-flow laminar device options available to conserve water. Vandal-resistant construction includes concealed sensor package, vandal-resistant laminar flow device, durable PVD finish options, and rotation-resistant locking nut.

### Overall Dimensions

- Height: 5-5/16" (135 mm)
- Reach: 4-7/8" (124 mm) to flow device
- Reach: 5-3/4" (146 mm) to sensor centerline

### Compatible Bradley Products

- [Verge Deck-Mounted Soap Dispenser – Metro Series](#)
- [Verge Lavatory Systems\\*\\*](#)
- [ELX Lavatory Systems\\*\\*](#)
- [LD-3010 OmniDecks\\*\\*](#)

Verify all rough-in dimensions prior to installation. Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.



### Finishes

-  Polished Chrome
-  Brushed Black Stainless\*
-  Brushed Stainless\*
-  Brushed Bronze\*
-  Brushed Brass\*
-  Brushed Nickel\*

\*PVD Finishes, see PVD Finishes section on Page 2.

### Product Compliance

#### Listed by IAPMO R&T to

- Uniform Plumbing Code (UPC)
- National Plumbing Code of Canada
- International Plumbing Code (IPC)
- ASME A112.18.1/CSA B125.1
- NSF/ANSI/CAN 61



#### Listed by NSF International to

- NSF/ANSI 372



#### Complies with

- ADA
- ICC/ANSI 117.1



Serves the American Disabilities Act and ICC/ANSI 117.1 guidelines, citations 309.4, 606.4 when installed according to these requirements

Consult local codes and standards.



## Operation

- Touch-free dual sensor activation
- Standard 11 second max run time per activation
- Standard 11 second auto system rinse if not activated within 24 hours
- Option for manual flush
- Low flow options 0.35 gpm (1.3 Lpm), 0.05 gpc (0.25 Lpc) or 0.50 gpm (1.9 Lpm), 0.09 gpc (0.35 Lpc)
- Laminar flow device

## Sensor Technology

- Dual sensor detects user's hand within a 4" detection range
- First sensor is always operating but does so under low power settings, while the second sensor is more accurate in its detection, minimizing false activations
- After the first sensor detects the presence of something, the second sensor is activated to ensure accurate activation of the fixture
- Sensors work in tandem to adapt to light, color, and optimize battery life
- Sensor has a narrow cone to prevent simultaneous activations with the soap dispenser

## Indicator Lights

- Power ON: Flashes red for 1.5 seconds
- Water dispense activation: Single flash green light
- Low power indication: Continuously flashing green light

## Power Source

### Standard Equipment

- Battery box
- 4x AA alkaline batteries included
- Battery life – alkaline up to 250,000 cycles per set
- Easily convert from battery only to AC adapter
- Low battery indicator with sensor package

### Optional Equipment

- Single AC adapter or AC adapter splitter kit (ordered separately)
- Splitter kit powers up to 4 faucets or combination of 4 faucets and soap dispensers
- 120V AC/6V DC plug-in adapter requires 120V/220V, 50/60Hz power source
- Battery box converts to battery back-up when using AC adapter

Verify all rough-in dimensions prior to installation.  
Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.

## Mounting

- Requires 1-1/4" to 1-3/8" centershank drilling
- When paired with Bradley lavatory, faucet drilling will be 1 1/4".
- Faucet comes with rotation-resistant connection

## Materials

Faucet comes in chrome-plated cast brass construction with optional in-stock PVD finishes\*

### \* PVD Finishes

Physical Vapor Deposition is an intricate, environmentally friendly finishing process that molecularly bonds the finish to the faucet, creating a very hard, durable surface that will not corrode, discolor, or tarnish

## Vandal Resistance

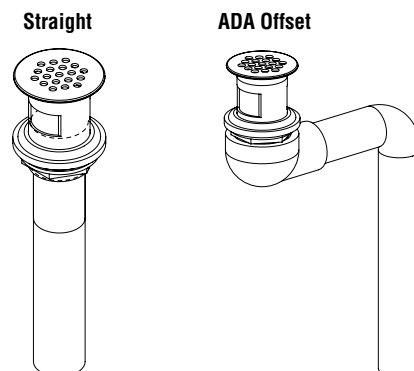
- Concealed sensor package deters vandalism
- Shank features rotation-resistant locking nut
- Vandal-resistant laminar flow device
- Durable PVD finish is scratch resistant

## Water Supply

- Operating water pressure range 20-125 psi
- Control module integrates choice of thermostatic mixing valve or tempered line valve to deliver tempered water
- Water source located outside of control module to prevent water damage to electrical components
- In-line filter included with mixing valve and tempered line valve to trap debris

## Drain Assembly

- Complete your faucet selection with an optional drain assembly
- Includes grid strainer in matching chrome-plated finish or PVD finishes
- Available in a straight or ADA offset configuration

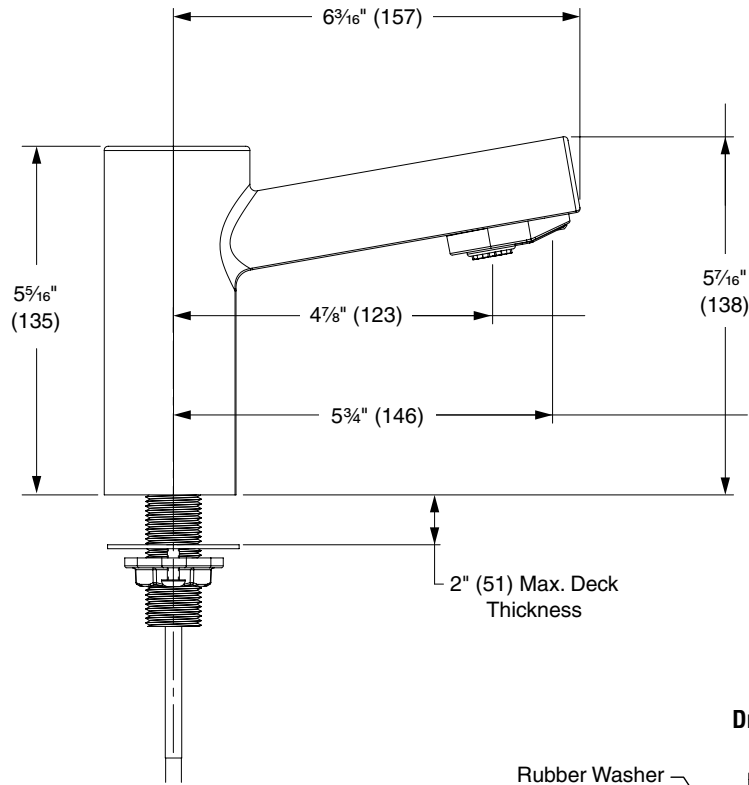




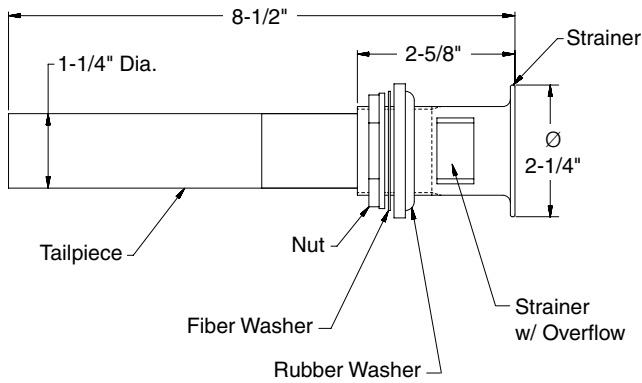


**Metro Series Faucet Dimensions**

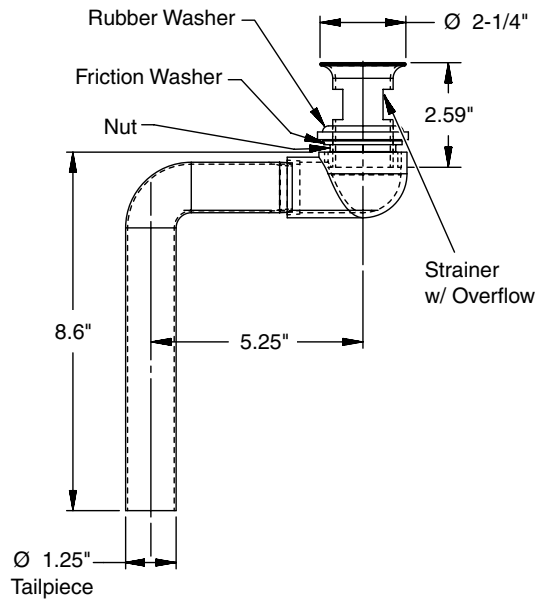
(mm)



**Straight Drain Assembly**



**ADA Offset Drain Assembly**



Verify all rough-in dimensions prior to installation.  
 Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.



### Metro Series Features - Soap and Faucet

- Refined, cylindrical design pairs with Verge™ faucet model S53-3300
- Matching soap and faucet designs that integrate seamlessly with Bradley lavatories\*\*
- Chrome-plated cast brass construction with optional in-stock PVD finishes\*
- Sensing optimized to eliminate false activations and maximize battery life
- Vandal-resistant features include concealed sensor package, durable PVD finish options, and rotation-resistant gasket/washer
- Patents pending

### Soap Key Features

- Foam or liquid soap options
- Top-fill individual and multi-feed tank options
- Utilizes universal bulk soap
- Vandal-resistant features
- Multi-station system supplies up to 6 soap dispensers
- Smart Sense System – Elegant translucent ring at the base of each dispenser gives a glowing indication of low battery, low soap, and overflow conditions
- Audible warning to stop filling before overflow occurs
- Spout reach designed to optimize handwashing space
- Touch-free infrared sensor-operated
- Power supply options to meet your application – battery pack or single AC plug-in adapter or AC adapter splitter assembly that accommodates up to 4 devices
- Cast brass spout construction with durable, environmentally-friendly finish\*

### Specification

Refined, cylindrical design pairs with faucet model S53-3300 and integrates seamlessly with Bradley lavatories\*\*. The dispenser is available with an individual or top fill multi-feed tank that is compatible with bulk foam or liquid soap. The multi-feed station system supplies soap to up to 6 soap dispensers. Activation through a touch-free infrared sensor that pairs seamlessly with Bradley's faucet dual sensor technology to eliminate false activations and maximize battery life. Dispenser shall feature chrome-plated cast brass construction with optional in-stock PVD finish. Vandal-resistant features include concealed sensor package, durable PVD finish options, and rotation-resistant gasket/washer.

### Overall Spout Dimensions

- Height: 4" (102 mm)
- Width: 1¾" (44 mm)
- Depth: 5½" (140 mm)

### Capacity

- Individual tank: 70.5 oz (2080 ml) w/ 2850 estimated activations per tank
- Multi-feed tank: 166.5 oz (5026 ml) w/ 6930 estimated activations per tank
- Multi-feed can support up to 6 soap dispensers

Verify all rough-in dimensions prior to installation. Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.



### Product Compliance

- ADA / ICC ANSI A117.1, Citation 309.4
- UL electrical components
- CE electrical components

### Finishes

Click on any color swatch to view as a larger image.

- Polished Chrome
- Brushed Black Stainless\*
- Brushed Stainless\*
- Brushed Bronze\*
- Brushed Brass\*
- Brushed Nickel\*

\*PVD Finishes, see PVD Finishes section.

### \* PVD Finishes

Physical Vapor Deposition is an intricate, environmentally friendly finishing process that molecularly bonds the finish to the faucet, creating a very hard, durable surface that will not corrode, discolor, or tarnish.

### Compatible Bradley Products

- [Verge Faucet – Metro Series](#)
- [Verge Lavatory Systems\\*\\*](#)
- [ELX Lavatory Systems\\*\\*](#)
- [LD-3010 Lavatory Systems\\*\\*](#)
- [Multi-Feed Soap Tank Assembly](#)



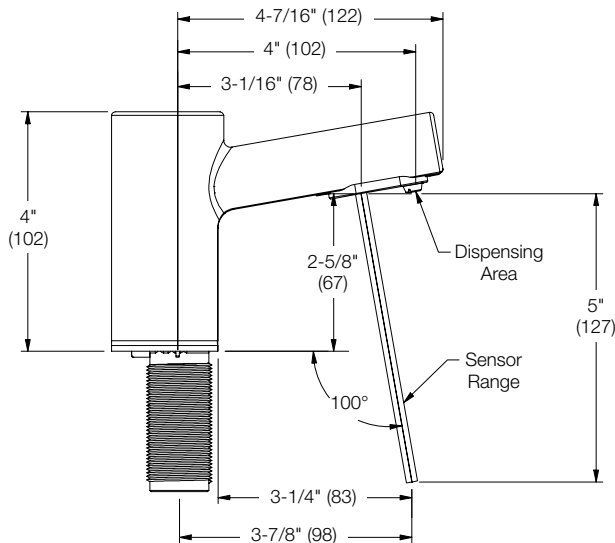
## Operation

Place hands under soap spout and hold for approximately 1.75 seconds. Spout will dispense liquid or foam soap depending on option selected.

- Allows 3 activations per 7.5 seconds.  
Liquid: 0.65 ml to 0.80 ml per activation  
Foam: 0.75 ml (liquid state) to 1.35 ml (foam state) per activation

## Sensor Technology

Infrared sensor with 4–5" (102–127 mm) activation range<sup>†</sup> that pairs seamlessly with Bradley's faucet dual sensor technology to eliminate false activations and maximize battery life. See Sensing Dimensions diagram.



<sup>†</sup> A minimum of 5" (127 mm) clearance between the sensor and surface or bowl is needed to ensure proper function of the sensor. For information on specific applications, please contact Bradley Technical Service.

## Indicator Lights

- Power ON (spout location): Flashes red for 1.2 seconds
- Power ON (multi-feed): Flashes green/red 3 times
- Soap dispense activation: Single flash green light
- Low power indication: Continuously flashing green light
- Low soap level: Flashes red when soap level is below 25% capacity
- Overflow condition: Steady red light with audible indication from buzzer lasts 2.5 seconds when fill level reaches 90% capacity

Verify all rough-in dimensions prior to installation.  
Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.

## Power Source

Choose a power supply that meets your application: (Power source is not automatically included with Verge soap dispensers and must be chosen from the list below.)

- Individual battery pack<sup>†</sup> – each set of batteries can accommodate up to 140,000 cycles
- Individual AC power adapter option for 120V/230V for use on a single device

Ordered separately:

- AC adapter splitter assembly accommodates up to 4 devices. Use when desired to serve in combination of multiple devices (faucet, soap dispenser, and multi-feed soap tank assembly) and/or stations. (Electrical Plug Type B<sup>\*\*\*</sup>)

<sup>†</sup>Quantity (4) D-cell batteries included with battery pack

## Mounting

**Accurate mounting is essential to ensuring proper sensor function and performance.** Verify all rough-in dimensions prior to installation. Shank will accommodate a maximum counter thickness of 1 1/2" (38 mm). Mount dispenser in 1 3/8" (35 mm) diameter hole in lavatory or countertop with a minimum of 5" (127 mm) clearance between the sensor and surface or bowl. To meet sensor range requirements with drop-in or vessel-style basin applications, the dispenser must be mounted on the basin and not on the counter or surface behind the basin.

## Product Materials

- Spout assembly: Chrome-plated cast brass w/ optional in-stock PVD finish
- Control box: ABS plastic
- Battery box: ABS plastic
- Soap tank: Polypropylene

## Soap Specifications







- Non-proprietary bulk soap (select foam or liquid)
- Liquid: Viscosity range of 100-5,000 cPs
- Foam: All-purpose foam hand soaps and antibacterial foam soaps containing PCMX and/or Triclosan

## Vandal Resistance

- Concealed sensor package deters vandalism
- Durable PVD finish is scratch resistant
- Rotation-resistant gasket/washer
- Tamper resistant screw



Verge™ Deck-Mounted Soap Dispenser – Metro Series

<b>Model</b>	
<b>6-3300</b>	Verge Deck-Mounted Soap Dispenser – Metro Series
<b>Required Selections</b> (must select one from each category)	
<b>Activation Type</b> (select one)	
<b>R</b>	Infrared Sensor Operation
<b>Soap Type</b> (select one)	
<b>F</b>	Foam
<b>L</b>	Liquid
<b>Fill System</b> (select one)	
<b>T</b>	Single (Top fill at spout)
<b>M</b>	<a href="#">Multi-Feed (Shared Tank, Top-Fill Port)</a>
<b>Finish Type</b> (select one)	
<b>PC</b>	 Polished Chrome
<b>BB</b>	 Brushed Black Stainless
<b>BS</b>	 Brushed Stainless
<b>BZ</b>	 Brushed Bronze
<b>BR</b>	 Brushed Brass
<b>BN</b>	 Brushed Nickel
<b>Power Supply</b> (select one)	
<b>A14-029</b>	AC Adapter - Electrical Plug Type B
<b>A14-030</b>	Battery Pack (includes 4x D-cell batteries)
<b>NONE</b>	No Power Supply Provided – must purchase A14-031 separately***

<b>Additional Parts for Purchase (Purchased Separately)</b>	
<b>Feature</b>	<b>Part Number</b>
*** AC Adapter Splitter Assembly accommodates up to 4 devices when desiring a combination of multiple devices (faucet, soap, & multi-feed soap tank assembly) and/or stations. (Electrical Plug Type B)	A14-031
Multi-Feed Soap Tank Assembly	6-SOAP-MFT

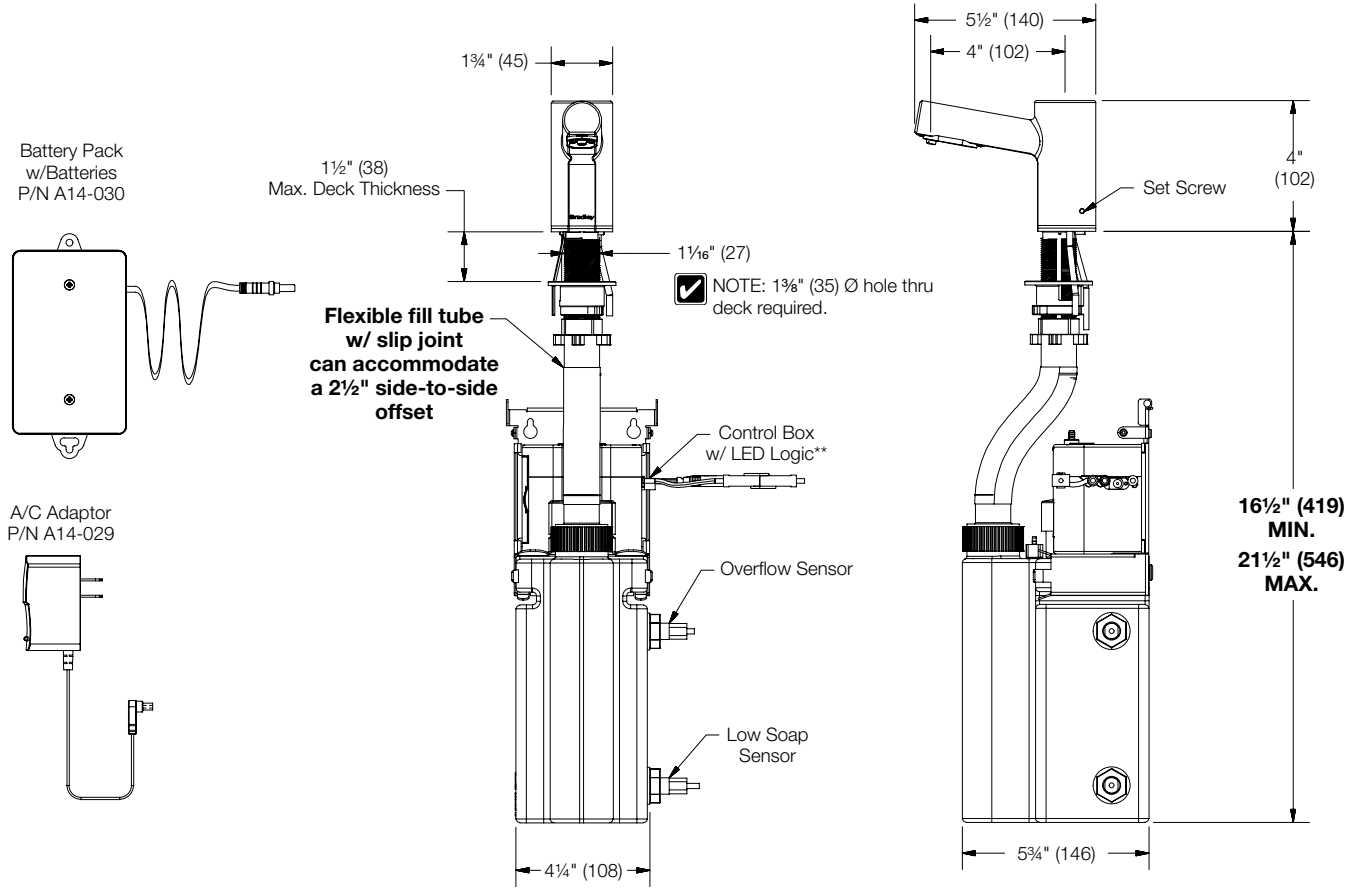
Verify all rough-in dimensions prior to installation. Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.



Dimensions – Single Top-Fill

(mm)

Note the dimension tolerances (bolded in the illustration below) before installation. Failure to adhere to these tolerances can cause the dispenser to work improperly.



\*\* NOTE: Battery pack or AC adaptor required. AC power source required to be within 54" (1371) of the control box.

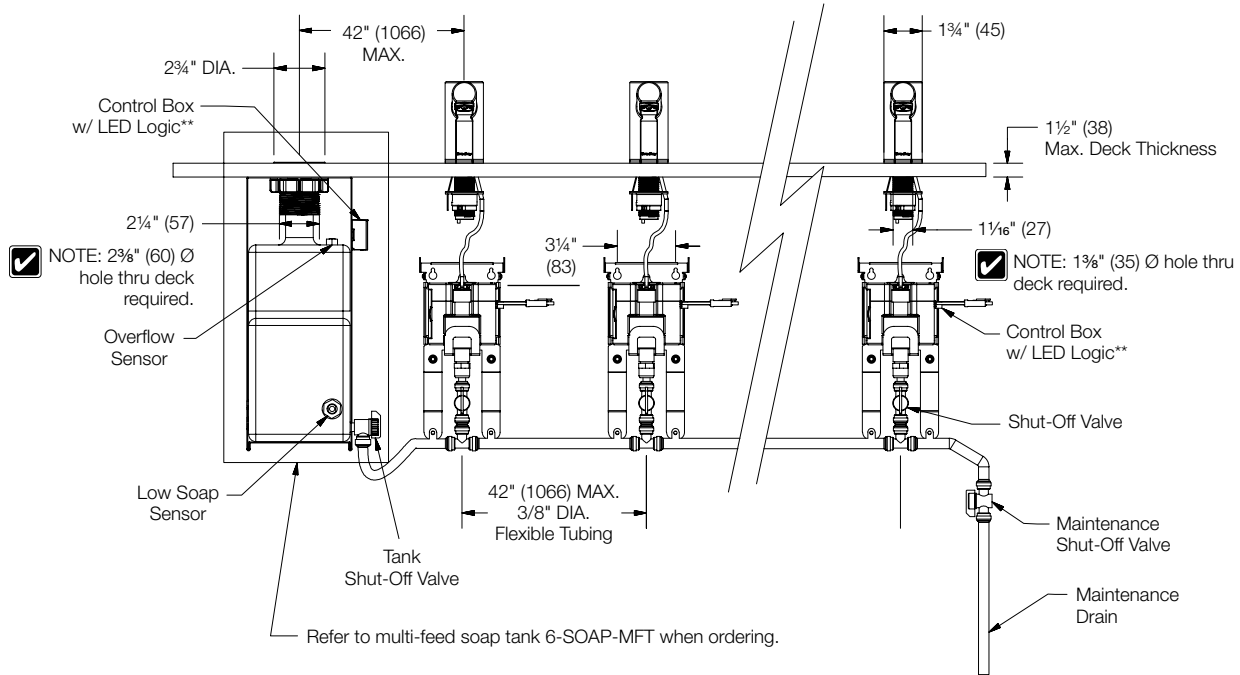
Verify all rough-in dimensions prior to installation. Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.





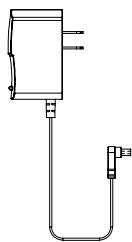
Dimensions – Multi-Feed System - End Tank

(mm)

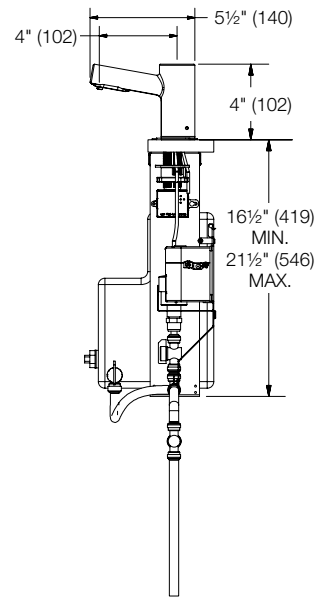
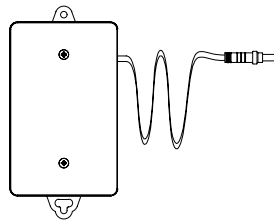


☑ \*\* NOTE: Battery pack or AC adaptor required.  
 AC power source required to be within 54" (1371) of the control box.

A/C Adaptor  
P/N A14-029



Battery Pack  
w/Batteries  
P/N A14-030

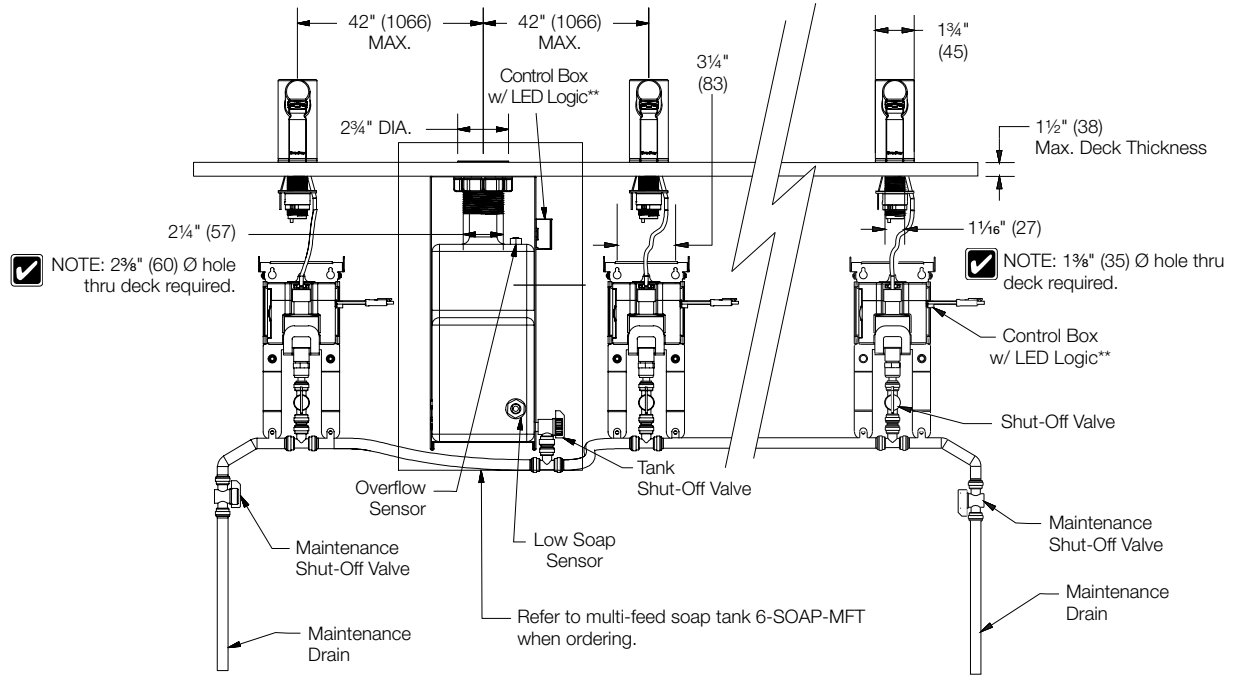


Verify all rough-in dimensions prior to installation.  
 Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.



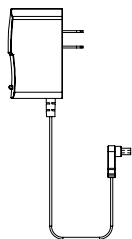
Dimensions – Multi-Feed System - Mid Tank

(mm)

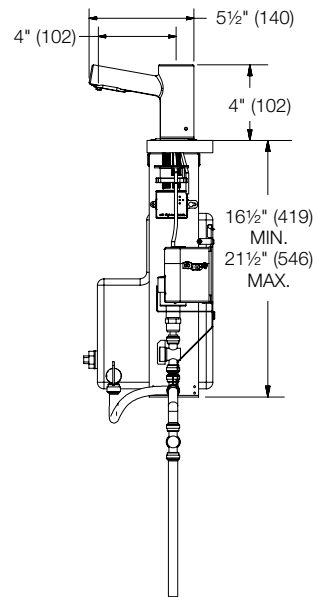
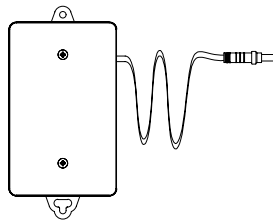


NOTE: Battery pack or AC adaptor required.  
 AC power source required to be within 54" (1371) of the control box.

A/C Adaptor P/N A14-029



Battery Pack w/Batteries P/N A14-030



Verify all rough-in dimensions prior to installation.  
 Consult local and national codes. Conformity and compliance to local and national codes is the responsibility of the installer.

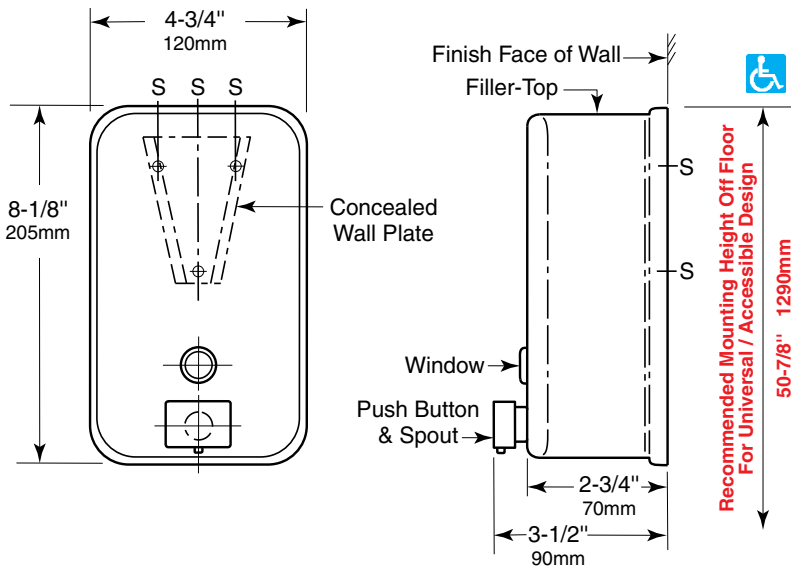
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## Technical Data

# ClassicSeries® SURFACE-MOUNTED SOAP DISPENSER

# B-2111



### MATERIALS:

**Container** — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin-finish. Body is drawn, one-piece, seamless construction. Back plate has mounting bracket attached. Furnished with concealed wall plate. Equipped with a clear acrylic refill-indicator window and a locked, hinged stainless steel lid for top filling. Capacity: 40-fl oz (1.2-L).

**Valve** — Black molded plastic push button and spout. Soap head-holding mushroom valve. Stainless steel spring. U-packing seal and duckbill. Antibacterial-soap-resistant plastic cylinder.

### OPERATION:

Corrosion-resistant valve dispenses commercially marketed all-purpose hand soaps. To prevent corrosion of the tank, use only chloride-free pH-neutral liquid soaps. Valve is operable with one hand, without tight grasping, pinching, or twisting of the wrist, and with less than 5 pounds of force (22.2 N) to comply with accessible design guidelines (including ADAAG in the U.S.A.). Window indicates when refill is required. The locked, hinged lid opens for top filling only with special key provided. Concealed, vandal-resistant mounting.

### INSTALLATION:

Secure wall plate to the wall with three sheet-metal screws, furnished by manufacturer, at points indicated by an S. Slide mounting bracket of container down onto wall plate and secure unit with furnished locking-screw. For plaster or dry wall construction, provide concealed backing to comply with local building codes and secure with sheet-metal screws furnished. For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws furnished, or provide 1/8" (3mm) toggle bolts or expansion bolts.

**Note:** Surface-mount the dispenser plumb and true with valve 6" (150mm) to right or left of lavatory center. Provide 4" (100mm) minimum clearance from the lid to the underside of any horizontal projection. Push buttons should be located 44" (1120mm) maximum above the finish floor.

### SPECIFICATION:

Surface-mounted soap dispenser shall be Type-304 stainless steel with satin-finish. Corrosion-resistant valve shall dispense commercially marketed all-purpose hand soaps, non-iodine based soaps and do not use alcohol based sensitizers. To prevent corrosion of the tank, use only chloride-free pH-neutral liquid soaps. Valve shall be operable with one hand and with less than 5 pounds of force (22.2 N) to comply with accessible design guidelines (including ADAAG in the U.S.A.). Container shall be equipped with a clear acrylic refill-indicator window; a locked, hinged stainless steel lid for top filling; and shall have a capacity of 40-fl oz (1.2-L). Unit shall have concealed, vandal-resistant mounting.

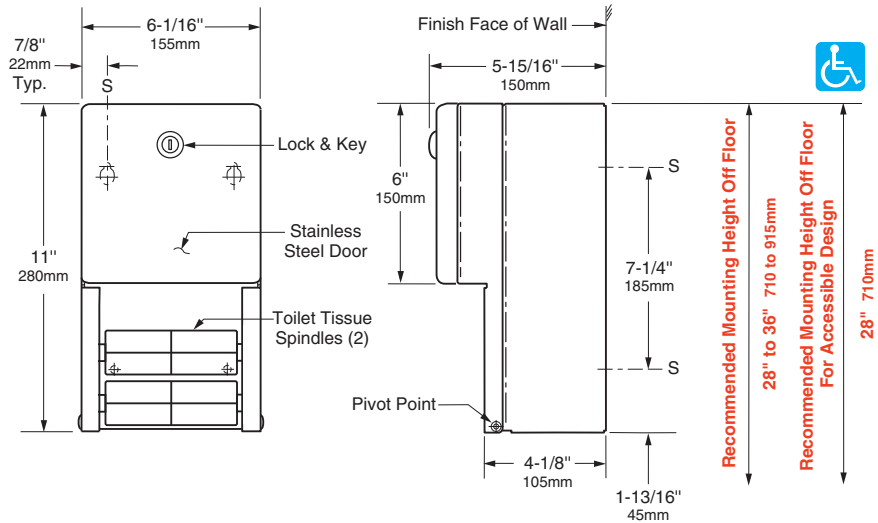
**Surface-Mounted Soap Dispenser shall be Model B-2111 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**



# Technical Data

# SURFACE-MOUNTED MULTI-ROLL TOILET TISSUE DISPENSER

# B-2888



### MATERIALS:

**Cabinet** — 18-8, type-304, 22-gauge (0.8mm) stainless steel. All-welded construction. Exposed surfaces have satin finish.

**Door** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with 18-gauge (1.2mm) stainless steel door frame. Exposed surfaces have satin finish. Front of door is drawn, one-piece, seamless construction. Secured to cabinet with two rivets. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

**Dispensing Mechanism, Inner Housing and Cam** — 18-8, type-304, 18-gauge (1.2mm) stainless steel.

**Spindles (2)** — Heavy-duty, one-piece, molded ABS. Theft-resistant. Retained in dispensing mechanism when door is locked.

### OPERATION:

Unit holds two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops in place when bottom roll is depleted. Depleted rolls can only be removed after unlocking door.

### INSTALLATION:

For partitions with particleboard or other solid core, secure with four #10 x 5/8" (4.8 x 16mm) sheet-metal screws (not furnished) at points indicated by an S, or provide through-bolts, nuts, and washers.

For hollow-core metal partitions, provide solid backing into which sheet-metal screws can be secured. If two units are installed back-to-back, then provide threaded sleeves and machine screws for the full thickness of partition.

For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure unit with sheet-metal screws.

For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws or provide 3/16" (5mm) toggle bolts or expansion bolts.

### SPECIFICATION:

Surface-mounted multi-roll toilet tissue dispenser shall be type-304 stainless steel with all-welded construction, including dispensing mechanism, inner housing and cam; exposed surfaces shall have satin finish. Front of toilet tissue dispenser door shall be drawn, one-piece, seamless construction. Door shall be secured to cabinet with two rivets and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Unit shall dispense two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Extra roll shall automatically drop in place when bottom roll is depleted. Unit shall be equipped with two theft-resistant, heavy-duty, one-piece, molded ABS spindles.

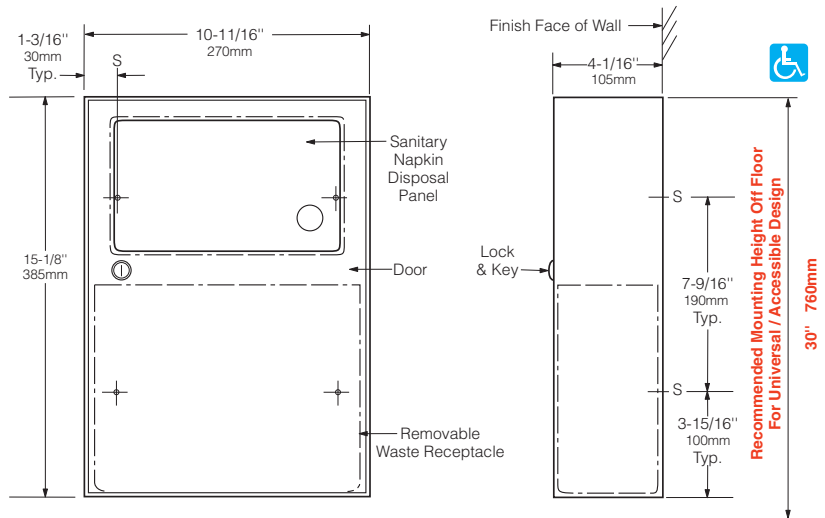
**Surface-Mounted Multi-Roll Toilet Tissue Dispenser shall be Model B-2888 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**



# Technical Data

# SURFACE-MOUNTED SANITARY NAPKIN DISPOSAL

# B-254



### MATERIALS:

**Cabinet** — 18-8, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.

**Door** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

**Disposal Panels (2)** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edges hemmed for safety. Secured to door and permanent panel with spring-loaded, full-length stainless steel piano-hinge. Equipped with international graphic symbol identifying sanitary napkin disposal.

**Waste Receptacle** — Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).

### OPERATION:

Unit is equipped with a self-closing panel covering each disposal opening. Napkin disposal is emptied by opening door with furnished key and removing waste receptacle.

### INSTALLATION:

For partitions with particle-board or other solid core, secure with four #8 x 1-1/4" (4.2 x 32mm) sheet-metal screws (not furnished), or provide through-bolts, nuts, and washers.

For hollow-core metal partitions, provide solid backing into which sheet-metal screws can be secured. If two units are installed back-to-back, then provide threaded sleeves and machine screws for the full thickness of partition.

For plaster or dry wall construction, provide concealed backing to comply with local building coeds, then secure unit with #8 x 1-1/4" (4.2 x 32mm) sheet-metal screws.

For other wall surfaces, provide fiber plugs or expansion shields for use with #8 x 1-1/4" (4.2 x 32mm) sheet-metal screws, or provide 3/16" (5mm) toggle bolts or expansion bolts.

### SPECIFICATION:

Surface-mounted sanitary napkin disposal shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Unit shall have a self-closing panel covering each disposal opening. Panel shall have bottom edge hemmed for safety, be secured to door with spring-loaded, full-length stainless steel piano-hinge, and equipped with international graphic symbols identifying sanitary napkin disposal. Unit shall be furnished with a removable, leak-proof molded polyethylene receptacle. Receptacle shall have a capacity of 1.2-gal. (4.6-L).

**Surface-Mounted Sanitary Napkin Disposal shall be Model B-254 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**



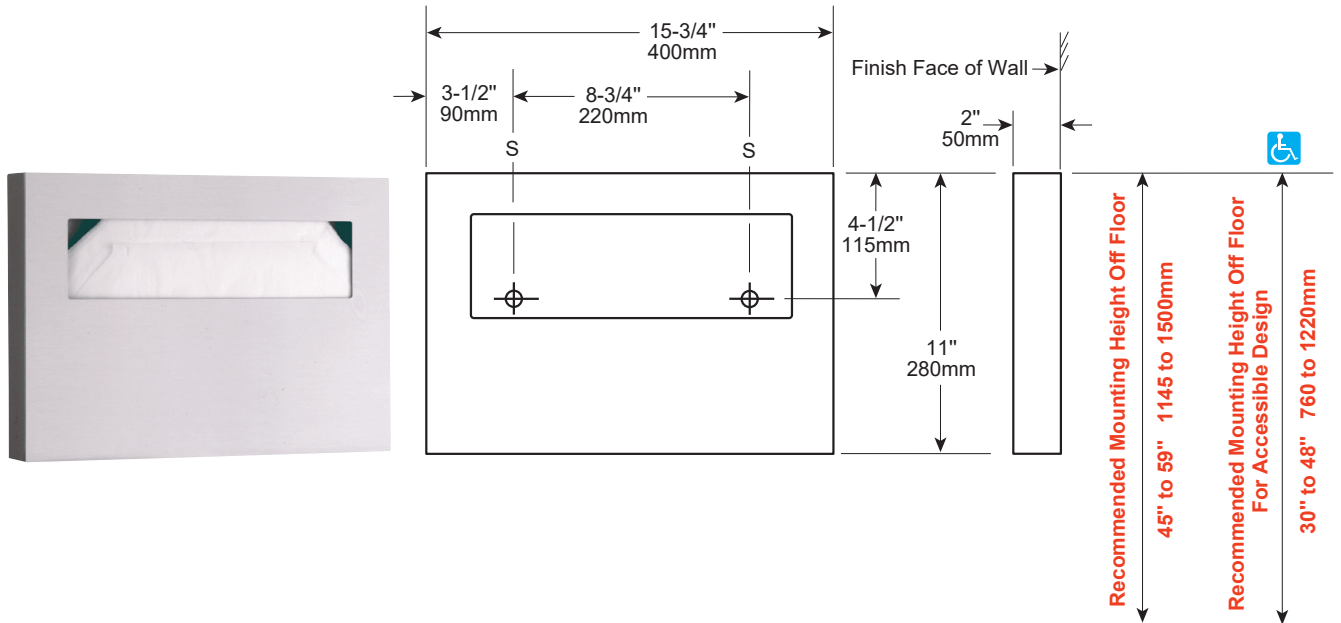
Technical Data

# ClassicSeries® SURFACE-MOUNTED SEAT-COVER DISPENSER

# B-221

Specify Finish Required

- Stainless Steel, Satin Finish
- Matte Black Finish, please use model no. B-221.MBLK



### MATERIALS:

18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. All-welded construction with beveled opening.

### OPERATION:

Dispenses single- or half-fold paper toilet seat covers from beveled opening. Dispenser fills from bottom through concealed opening. Capacity: 250 toilet seat covers or one box.

### INSTALLATION:

Mount unit on wall or toilet partition with two flat-head screws, not furnished by manufacturer, at points indicated by an S. For plaster or dry wall construction, provide concealed backing that complies with local building codes, then secure unit with flat-head screws not furnished. For other wall surfaces, provide fiber plugs or expansion shields for use with screws, not furnished, or provide 1/8" (3mm) toggle bolts or expansion bolts.

Note: Provide a 5" (125mm) minimum clearance from bottom of dispenser to top of any horizontal projection to provide room for filling dispenser from bottom.

### SPECIFICATION:

Surface-mounted toilet-seat-cover dispenser shall be type-304, 22-gauge (0.8mm) stainless steel with all-welded construction; exposed surfaces shall have satin finish. Dispenser shall have a concealed opening in bottom for filling. Capacity shall be 250 paper toilet seat covers or one box.

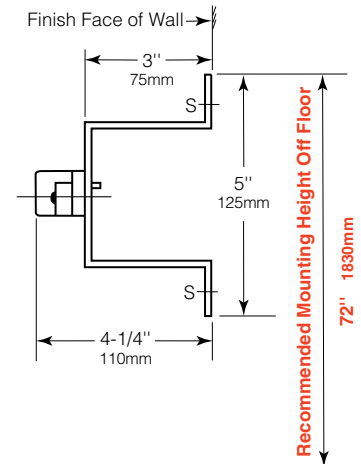
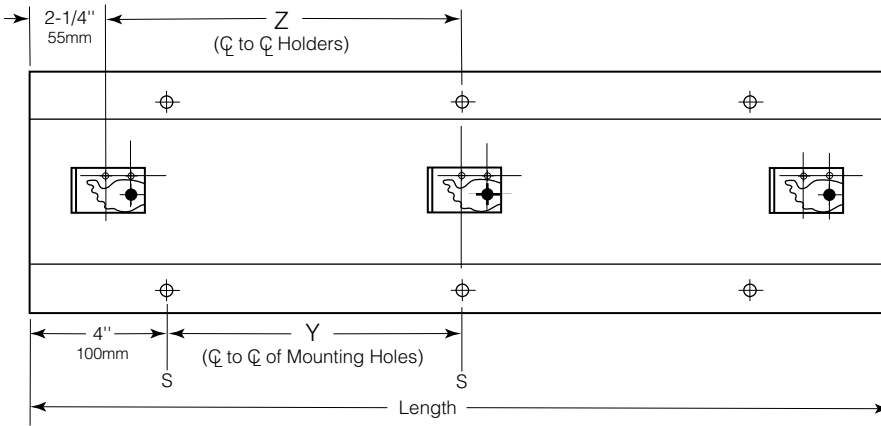
**Surface-Mounted Seat-Cover Dispenser shall be Model B-221 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**



Technical Data

# STAINLESS STEEL MOP AND BROOM HOLDER

# B-223



### STANDARD STOCK SIZES

Model No.	Length	No. of Holders	Dim. Y	No. of Mtg. Holes	Dim. Z
B-223 x 24	24" (610mm)	3	8" (205mm)	6	9-3/4" (250mm)
B-223 x 36	36" (915mm)	4	14" (355mm)	6	10-1/2" (265mm)

### MATERIALS:

**Mounting Base** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish.

**Mop and Broom Holders** — Spring-loaded rubber cam holders with anti-slip coating. Powder coated steel retainers.

### OPERATION:

Surface-mounted holder is designed to keep mops and brooms away from wall. Spring-loaded rubber cam holders accommodate handles from 7/8" to 1-1/4" (20 to 30mm) diameter.

### INSTALLATION:

Secure unit to wall with six sheet-metal screws, furnished by manufacturer, at points indicated by an S. For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure unit with stainless steel mounting screws. For other wall surfaces, provide fiber plugs or expansion shields for use with stainless steel mounting screws, or provide 1/8" (3mm) toggle bolts or expansion bolts.

### SPECIFICATION:

Mop and broom holder shall be type-304 stainless steel with satin finish. Unit shall be \_\_\_\_\_ (insert length) long with \_\_\_\_\_ (insert number) spring-loaded rubber cam holders.

**Stainless Steel Mop and Broom Holder shall be Model \_\_\_\_\_ (insert model number) of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**





# Technical Data

# QuietDry™ Series TrimDry™ SURFACE-MOUNTED ADA DRYER

# B-7120 B-7128

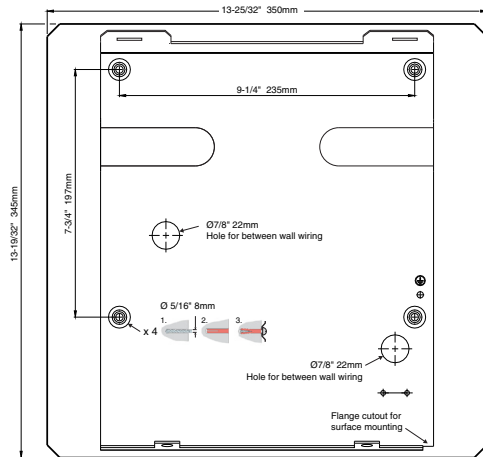
### Specify Voltage Required:

- B-7120 Dryer with White Painted Cover
- B-7128 Dryer with Stainless Steel Cover

Specify model number followed by voltage required.  
Example: B-7128 115V for 115-volt Stainless steel cover hand dryer.

### Specify Voltage Required:

- 115V AC, 15 Amp, 1725 Watts, 50/60 Hz, Single Phase, cULus Listed.
- 208-240V AC, 6.8-7.8 Amp, 1400-1900 Watts, 50/60 Hz, Single Phase, cULus Listed, VDE approved and CE marked.

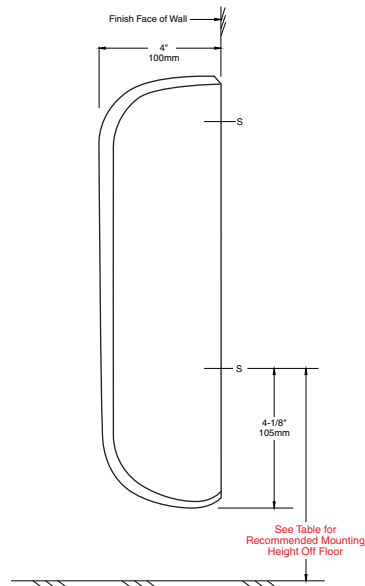


### \*RECOMMENDED MOUNTING HEIGHTS

Children's Washrooms, ages 3-4	36" (915mm)
Children's Washrooms, ages 5-8	40" (1015mm)
Children's Washrooms, ages 9-12	44" (1120mm)
Universal Design	48" (1219mm)



\*Bottom screw hole of mounting base to finish face of floor



### MATERIALS:

**Cover** — 22-gauge galvanized steel with exposed surface type-304 stainless steel with #4 satin-finish vertical grain (B-7128) or 22-gauge mild steel zinc plated with high-gloss white epoxy paint finish (B-7120) covers with UL 94-5VA black plastic trim and side panels. Cover equipped with uniquely designed dual air outlets. Air-inlet is equipped with vandal-resistant grille. Cover projects no more than 4" (100mm) from wall and is secured to mounting base with two vandal-resistant, recessed hex screws.

**Mounting Base** — 20-gauge (1.5mm) plated steel with four 0.236" (6mm) diameter mounting holes.

**Motor** — Universal, 1/7 hp, 8000 rpm, on resilient mounting. Sealed ball bearing at drive-shaft end and self-lubricating sleeve bearing at nondrive end. Equipped with automatic thermal-overload switch.

**Fans** — Two balanced, double-inlet centrifugal fans are mounted on motor shaft; directs airflow over heating element at 71 cfm.

**Heating Element** — Two coiled nickel-chrome heating elements are mounted in mica frame and protected by automatic thermal-overload switches. Heating elements, heat air without hot spots — inaccessible to vandals.

**Electronic Control** — Infrared sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Remove hands from path of sensor and dryer stops. Electronic sensor has automatic shutoff approximately 1-1/2 minutes after dryer turns on if an inanimate object is placed across air-outlet opening. After inanimate object is removed, electronic sensor automatically resets itself and dryer operates normally.

continued . . .



## OPERATION:

No-touch operation: electronic sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Dual air outlets provide a swirling circulation of airflow for comfortable hand drying. Drying time less than 25 seconds. Remove hands from path of sensor and dryer stops. Dryer operates only when actually drying hands, which saves energy and operating costs. Electronic sensor will automatically shut dryer off 1-1/2 minutes after dryer turns on if an inanimate object, such as tape or chewing gum, is placed across air-outlet opening. After inanimate object is removed, electronic sensor automatically resets itself and dryer operates normally.

**10-Year Limited Warranty** — In addition to Bobrick's one-year guarantee, Bobrick extends a limited 10-year warranty from the date of purchase on all parts for Model B-7120 and B-7128 hand dryer, except motor brushes, to the original owner of the installed unit against defects in factory workmanship or material under normal use and service. Motor brushes are warranted for three years from date of purchase. This warranty is limited to the repair or exchange of defective parts at the option of Bobrick. See Installation Instruction Sheet, Form No. 712-69, for full details.

## INSTALLATION:

**Wall preparation:** Locate mounting base on wall using template provided. For brick, stone, and concrete walls drill four 0.315" (8mm) holes to suit provided wall plugs 0.315" (8mm) x 1-1/4" (45mm) and screws # 10 (4.8mm) x 2" (50mm) long. See template for wall plug and screw installation details. For plaster or dry wall construction, provide concealed backing to comply with local building codes and secure with four #10 (4.8) round-head sheet-metal screws or 3/16" (5mm) toggle bolts (not furnished). Provide electrical service from nearest distribution panel to dryer mounting base in conformance with local electrical codes.

### Wiring Instructions:

1. For 115-Volt Dryers — Connect ground wire to ground terminal marked  $\equiv$ , the black or *hot* wire to terminal marked *L1*, and neutral or white wire to terminal marked *N*.
2. For 208–240-Volt Dryers — Connect ground wire to ground terminal marked  $\equiv$  and the 208-240-volt wires to terminal marked *L1* and *L2*.

**Notes:** Electronic sensor in Automatic dryers will pick up movement within 6" (150mm) of the air-outlet opening. Use caution when choosing location for Automatic dryers in confined areas. Consider proximity to doorways and other traffic areas.

Bobrick automatic hand dryers should be installed at least 15" (380mm) above any projection or horizontal surface which may interfere with the operation of the automatic sensor.

For installation instructions that include step-by-step installation procedures and details of electrical service connections, see Form No. 712-69, which is packed with each shipment. This form is also available in advance upon request.

## SPECIFICATION:

Surface-mounted hand dryer shall have either 22-gauge galvanized steel with exposed surface type-304 stainless steel with #4 satin-finish vertical grain (B-7128) or 22-gauge mild steel zinc plated with high-gloss white epoxy paint finish (B-7120) covers with UL 94-5VA black plastic trim. Slim profile cover shall project no more than 4" (100mm) from the finished face of wall to comply with accessible design guidelines (including ADAAG in the U.S.A.). Unit shall be equipped with dual air outlets that provide a swirling circulation of airflow for (less than 25 seconds) hand dry. Motor shall be 1/7 hp, universal type on resilient mounting with sealed ball bearing at drive-shaft end and self-lubricating sleeve bearing at nondrive end; equipped with automatic thermal-overload switch. Heating elements shall be located on outlet side of fan, shall heat air without hot spots, be inaccessible to vandals, and protected by an automatic thermal-overload switch. Electronic sensor shall automatically turn dryer on when hands are held under air-outlet opening and across path of sensor. Dryer shall turn off automatically when hands are removed. Sensor shall automatically shut dryer off approximately 1-1/2 minutes after dryer turns on if an inanimate object is placed across air-outlet opening. After inanimate object is removed, electronic sensor shall automatically reset itself and dryer shall operate normally. Unit shall be cULus Listed, and/or VDE approved, CE marked. Unit shall comply with EU Directive "Restriction of Hazardous Substance" (ROHS) requirements for non-use of certain hazardous substances in the production of electronic products. Unit shall be protected by a limited 10-year warranty on all parts except motor brushes. Motor brushes shall be warranted for three years from date of purchase.

**QuietDry™ Series TrimDry™ Surface-Mounted ADA Hand Dryer shall be Model B-7120 and B-7128 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**

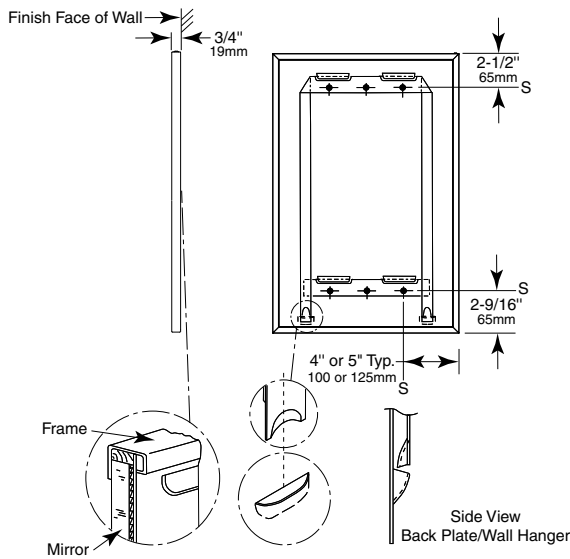


**Designer's Notes:**

1. Special-order sizes available on request.
2. Maximum size mirror available, 96" x 72" (244 x 183cm); minimum size, 12" x 12" (30 x 30cm).
3. All Bobrick framed mirrors are manufactured to overall width and height dimensions. EXAMPLE: A 24" x 36" (61 x 91cm) mirror will be furnished 24" x 36" (61 x 91cm) outside-of-frame to outside-of-frame.
4. To specify special sizes use Series Number followed by width then height in inches. EXAMPLE: B-165 2024.
5. Bobrick framed mirrors are manufactured to a tolerance 1/8" (3.2mm).
6. For sufficient space to lift mirror onto wall hanger(s), provide 1" (25mm) minimum clearance above top of mirror frame.
7. Provide 1" (25mm) minimum clearance at bottom of mirror for unlocking mirror from wall and 1/2" (12.7mm) minimum clearance on each side.

**Snap Locking Design  
(Rear View)**

Figure: 1

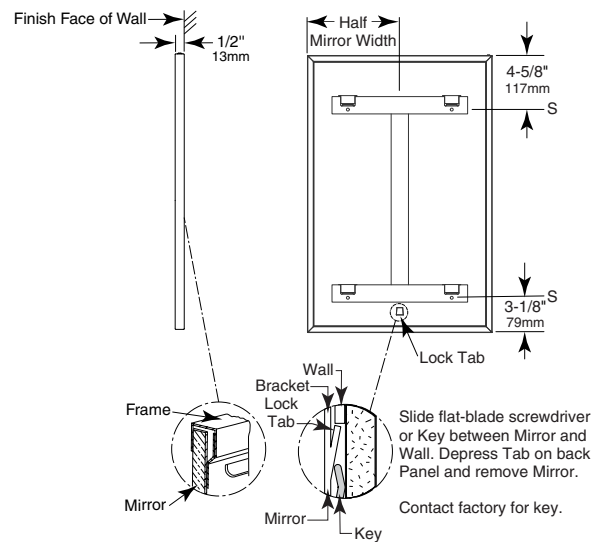


**STANDARD B-165 SERIES MIRRORS**

MODEL NO.	OVERALL SIZE	
	W	H
B-165 1824	18" (46cm)	24" (61cm)
B-165 1830	18" (46cm)	30" (76cm)
B-165 1836	18" (46cm)	36" (91cm)
B-165 2436	24" (61cm)	36" (91cm)
B-165 2448	24" (61cm)	48" (122cm)
B-165 2460	24" (61cm)	60" (152cm)

**Lock Tab Design  
(Rear View)**

Figure: 2



**STANDARD B-165 SERIES MIRRORS**

MODEL NO.	OVERALL SIZE	
	W	H
B-165 4836	48" (122cm)	36" (91cm)

**All Other Size Mirrors**

**Note:** Mirrors greater than 30" in width will have multiple hanger brackets with a typical 8" off each edge.

Width	Hangers
Up to 30" (Up to 76cm)	1
31" to 41" (78 to 104cm)	2
42" to 72" (106 to 183cm)	3
73" to 91" (185 to 231cm)	4
92" to 96" (233 to 243cm)	5

continued . . .

## MATERIALS:

**Frame** — Type-430 stainless steel, 1/2" x 1/2" x 3/8" (13 x 13 x 9.5mm) channel with 1/4" (6mm) return at rear for Snap Locking Design; 1/2" x 1/2" x 1/2" (13 x 13 x 13mm) channel for Lock Tab Design, with bright polished finish. One piece frame with 90 degree mitered corners. Galvanized steel back has integral horizontal hanging brackets near the top for hanging the mirror and near the bottom to prevent the bottom of the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger.

**Mirror** — No. 1 quality, 1/4" (6mm) select float glass: selected for silvering, electrolytically copper-plated by the galvanic process, and guaranteed for 15 years against silver spoilage. Back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, polyethylene padding.

**Concealed Wall Hanger** — Galvanized steel construction. Incorporates upper and lower support members, which engage backplate louvers to keep mirror against wall.

## INSTALLATION:

Mount wall hanger on wall with screws (not furnished) at points indicated by an S. For plaster or dry wall construction, provide backing to comply with local building codes, then secure wall hanger with screws (not furnished). When providing a concealed backing, allow backing to cover minimum range of mounting hole locations shown on drawing. For other wall surfaces, provide fiber plugs or expansion shields for use with screws (not furnished), or provide 1/8" (3mm) toggle bolts or expansion bolts. Hang mirror on wall hanger with all four backplate louvers engaged behind horizontal wall hanger members. To do this, mirror must be centered in front of the wall hanger horizontally, pressed flat against the wall approximately 1" (25mm) above final position and then lowered into final position.

**Snap Locking Design** — Locking devices automatically secure mirror to concealed wall hanger when it is lowered into final position (see figure 3). Locking devices may be unlocked by inserting two flat blade screwdrivers behind each side of mirror near the bottom or under the bottom of the mirror and pulling mirror bottom forward and then up.

**Lock Tab Design** — Locking devices automatically secure mirror to concealed wall hanger when it is lowered into final position (see figure 4). Locking device may be unlocked by sliding a flat-blade screwdriver or Key between mirror and wall at center of mirror and depressing tab on back panel. If key is required, please contact the factory.

**Snap Locking Design  
(Front View)**

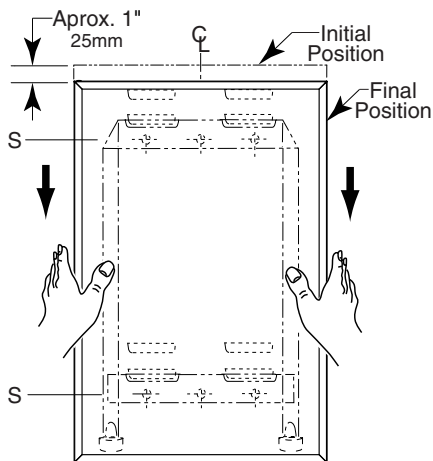


Figure: 3

**Lock Tab Design  
(Front View)**

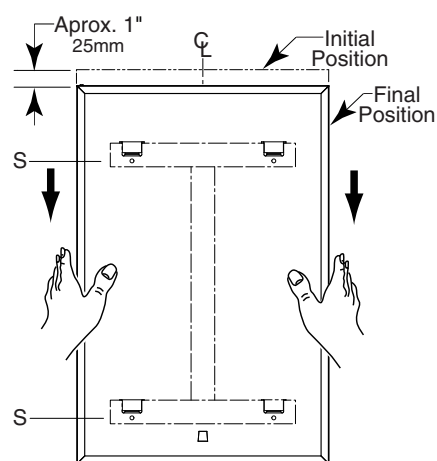


Figure: 4

## SPECIFICATION:

Mirror shall have a one-piece type-430 stainless steel channel frame, with 90° mitered corners; all exposed surfaces shall have bright polished finish. Select float glass mirror shall be guaranteed for 15 years against silver spoilage. The back shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top and bottom for mounting on concealed wall hanger to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger. Mirror shall be removable from the wall.

**Framed Mirror shall be Model B-165 \_\_\_\_\_ (insert width and height) of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**

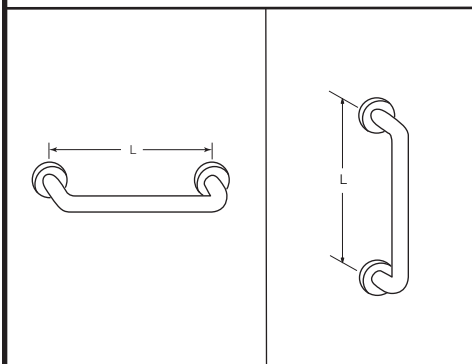
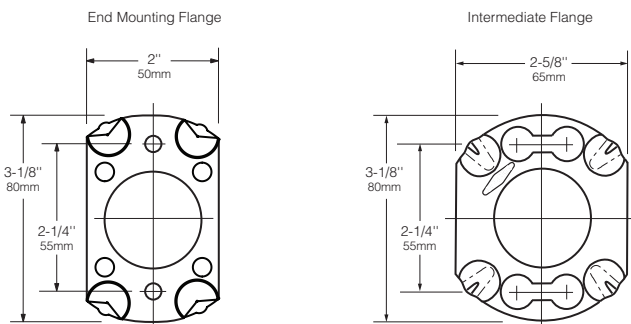
**BOBRICK**

**Technical Data**

**1 1/4" (32mm) DIAMETER  
STAINLESS STEEL GRAB BARS  
WITH SNAP FLANGE**

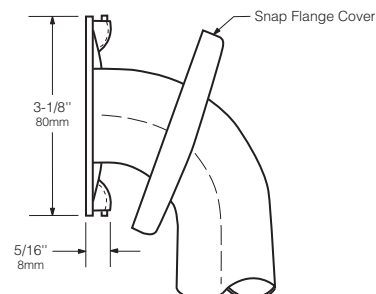
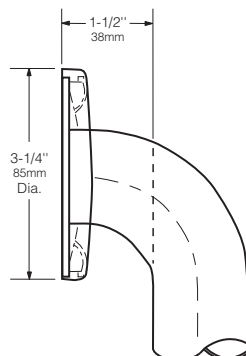
**B-5806  
SERIES**

- Specify Finish Required:  Satin-finish, slip-resistant surface.  
 Peened surface; add suffix .99 to model number

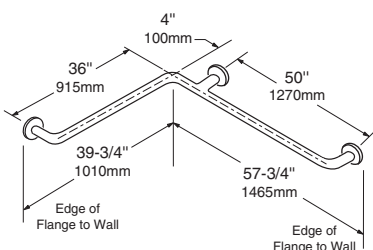


**HORIZONTAL**

**VERTICAL**

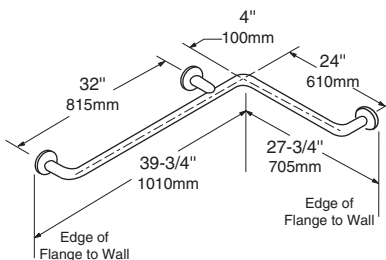


**B-5806 x 18, 24, 30, 36, 42, 48**



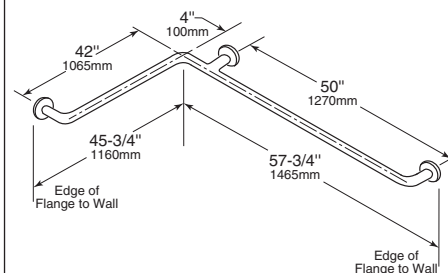
**TWO-WALL  
TUB / SHOWER  
COMPARTMENT BAR**

**B-5837**



**HORIZONTAL  
TUB / SHOWER  
COMPARTMENT BAR 24 x 36**

**B-58616**



**TWO-WALL  
TOILET COMPARTMENT BAR 42 x 54**

**B-5897**

continued . . .

**MATERIALS:**

**Grab Bar** — 18-8, Type-304, 18-gauge (1.2mm) stainless steel tubing with a satin-finish, slip-resistant surface. 1-1/4" (32mm) outside diameter. Ends are heliarc welded to concealed mounting flanges. Clearance between the grab bar and wall is 1-1/2" (38mm).

**Concealed Mounting Flanges** — 18-8, Type-304, 11-gauge (3.2mm) thick, stainless steel plate; end flanges 2" x 3-1/8" (50 x 80mm) with holes for attachment to wall. Intermediate flanges 2-5/8" x 3-1/8" (65 x 80mm) wide x 3-1/8" (80mm) diameter.

**Snap Flange Covers** — 18-8, Type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-1/4" (85mm) diameter x 5/8" (16mm) deep. Each cover snaps over mounting flange to conceal mounting screws.

**STRENGTH:**

Bobrick grab bars that provide 1-1/2" (38mm) clearance from wall can support loads in excess of 900 pounds (408kg) if properly installed. Other grab bar configurations can support loads in excess of 250 pounds (113kg) if properly installed, complying with accessible design (including ADAAG in the U.S.A.) for structural strength.

**Safety Warning: Grab bars are no stronger than the anchors and walls to which they are attached and, therefore, must be firmly secured in order to support the loads for which they are intended. To avoid potential injury, the building owner or maintenance personnel should remove the grab bar from service if the grab bar is not adequately secured to wall or if there is any observed damage to the welds.**

**INSTALLATION:**

Provide concealed anchor device or backing as specified or required in accordance with local building codes before wall is finished. Fasten concealed mounting flanges to anchor device or backing with at least two screws opposing each other in each flange. Snap flange covers over each mounting flange to conceal mounting screws. Concealed anchor devices and mounting screws are not included with Bobrick grab bars and must be specified as an accessory.

For Grab Bars with an Intermediate Flange(s), Pull Snap-Flange Covers away from mounting flanges. Place grab bar in desired mounting location. Use intermediate flange as a template to mark location of mounting screws at intermediate flange only. Mark screw locations at the center of the slot in the middle of the double-keyhole shaped mounting holes (2) in the intermediate flange. Remove grab bar from wall. Drive the intermediate flange mounting screws into wall at marked locations. **Note:** Make sure to leave a space of just over 1/8" (3.17mm) between the underside of the screw head and the wall. Install grab bar on the wall by placing the round ends of the intermediate flange double-keyhole shaped mounting holes over the mounting screws (2) are located in the middle of the flange slots. Install the mounting screws into the wall at the end flanges and secure tightly. Tighten the mounting screws at the intermediate flange. Press all snap-flange covers into place to conceal mounting flanges.

**Note:** Recommend use of 1/4" or #14 sheet metal or wood screws to install Intermediate Flange. #12 screws may also be used.

**Important Notes:**

- Mounting Kits** — Bobrick offers a mounting kit for installing grab bars; **one Bobrick mounting kit is required for each flange.**

Mounting Kit No.	Description
252-30	Consists of (3) #14 x 2½" Type-304 stainless steel, Phillips round-head, sheet-metal screws.

- Grab Bar Fastener** — Bobrick offers a grab bar fastening system that secures all Bobrick grab bar series; **one Bobrick fastener is required for each flange.** Install grab bar without backing in wall requires minimum 5/8" (16mm) thick painted or tiled drywall.

WingIt™ Fastener No.	Description
251-4	Consists of 10–32 x 5/16" round-head, Phillips 18/8 stainless steel screws. (1) WingIt grab bar fastener.

- Optional Anchor Device** — Bobrick grab bar anchor device includes stainless steel machine screws to be used for attaching grab bars to anchors. **one Bobrick concealed anchor device is required for each flange.**

Optional Anchor No.	Description
2583	Anchor for 3/4" to 1" (19-25mm) panel 1 anchor required for each flange.
2586	Anchor for 1/2" to 1" (13mm) panel 1 anchor required for each flange.

**SPECIFICATION:**

Grab bar shall be Type-304 stainless steel with a satin-finish, slip-resistant surface. Grab bar shall have 18-gauge (1.2mm) wall thickness and 1-1/4" (32mm) outside diameter. Clearance between the grab bar and wall shall be 1-1/2" (38mm). Concealed mounting flanges shall be 11-gauge (3.2 mm) thick stainless steel plate, 2" x 3-1/8" (50 x 80mm), and equipped with at least two screw holes for attachment to wall. Flange covers shall be 22-gauge (0.8mm) stainless steel, 3-1/4" (85mm) diameter, and shall snap over mounting flanges to conceal mounting screws and/or WingIt fasteners. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Grab bar shall comply with accessible design (including ADAAG in the U.S.A.) for structural strength.

**Grab Bar shall be Model \_\_\_\_\_ (insert model number) of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; and Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**

## LOW VOLTAGE AND HIGH VOLTAGE TECHNICAL SPECIFICATION

### Electrical

Input voltage: Low voltage = 100–120V, High voltage = 200–240V  
 Frequency: 100–115V at 50/60Hz, >115–120V at 60Hz; 200–240V at 50/60Hz  
 Standby power consumption: Less than 0.5W  
 Motor specification: 1000W, digital V4 brushless motor  
 Motor switching rate: 5,500 per second  
 Motor speed: 83,000rpm  
 Amp: Dedicated hand dryer circuit required. Reference NEC/local electrical code for loading. 9.09A at 110V; 4.54A at 220V  
 Heater type: None

### Construction

Fascia: Polycarbonate  
 Antibacterial coating type:  
 HU02 (Sprayed Nickel) contains antibacterial additive in paint.  
 HU02 (White) contains antibacterial moulded additive.  
 Can help prevent the growth of bacteria.  
 Back plate mounting bracket: ABS/PBT Plastic  
 Exterior screw type: Anti-tamper <sup>4</sup>/<sub>25</sub>" (4mm) Pin-Hex  
 Water ingress protection to IP24  
 Net weight: 6.32lbs / 2.86kg

### Filter

Sealed HEPA filter (glass fiber and fleece prelayer)  
 Captures 99.97% of particles as small as 0.3 microns

### Operation

Touch free capacitive sensor activation  
 Hand dry time measurement: 12 seconds  
 (measurement based on NSF P335 to a measurement of 0.1g residual moisture)  
 Sound power level: 79dB(A)  
 Sound pressure level @ 2m: 63dB(A)\*  
 Operation lock-out period: 30 seconds  
 Airspeed at aperture: 420mph at Low voltage, 430mph at High voltage  
 Maximum altitude: 9,842 feet / 3,000 meters  
 Operating airflow: up to 5.3 gallons/sec and up to 42.38CFM  
 Operating temperature range: 32°–104°F / 0°–40°C

### Logistics

Unit barcode:  
 Sprayed Nickel – Low voltage: 885609009933, High voltage: 885609009797  
 White – Low voltage: 885609009896, High voltage: 885609009179  
 Packaged weight: 9.52lbs / 4.32kg  
 Packaged dimensions:  
 Height 5 <sup>3</sup>/<sub>4</sub>" (145mm) × Width 17 <sup>7</sup>/<sub>8</sub>" (455mm) × Depth 10 <sup>3</sup>/<sub>4</sub>" (274mm)  
 Pallet quantity: 56

### Standard warranty

5 year parts (self-service)



### Product range (Select one)

#### HU02 Sprayed Nickel

**Part number/SKU**  
 Low Voltage: 307174-01  
 High Voltage: 307172-01

#### HU02 White

**Part number/SKU**  
 Low Voltage: 307173-01  
 High Voltage: 307171-01



### Accreditations

Carbon Trust, NSF International  
 ADA compliant  
 Contributes to LEED certification  
 Contributes towards satisfying Feature W08 under the WELL Building Standard™



The Carbon Reduction Label is the registered trade mark of the Carbon Trust. The NSF logo is the registered trade mark of NSF International. International WELL Building Institute™ and the related logo are trademarks used with permission from the International WELL Building Institute™.

\*Sound pressure measured at 6.56 feet (2 meters) distance, in a semi-anechoic chamber.

For more information, please contact Dyson:

1-888-397-6622 | design@dyson.com | www.dyson.com

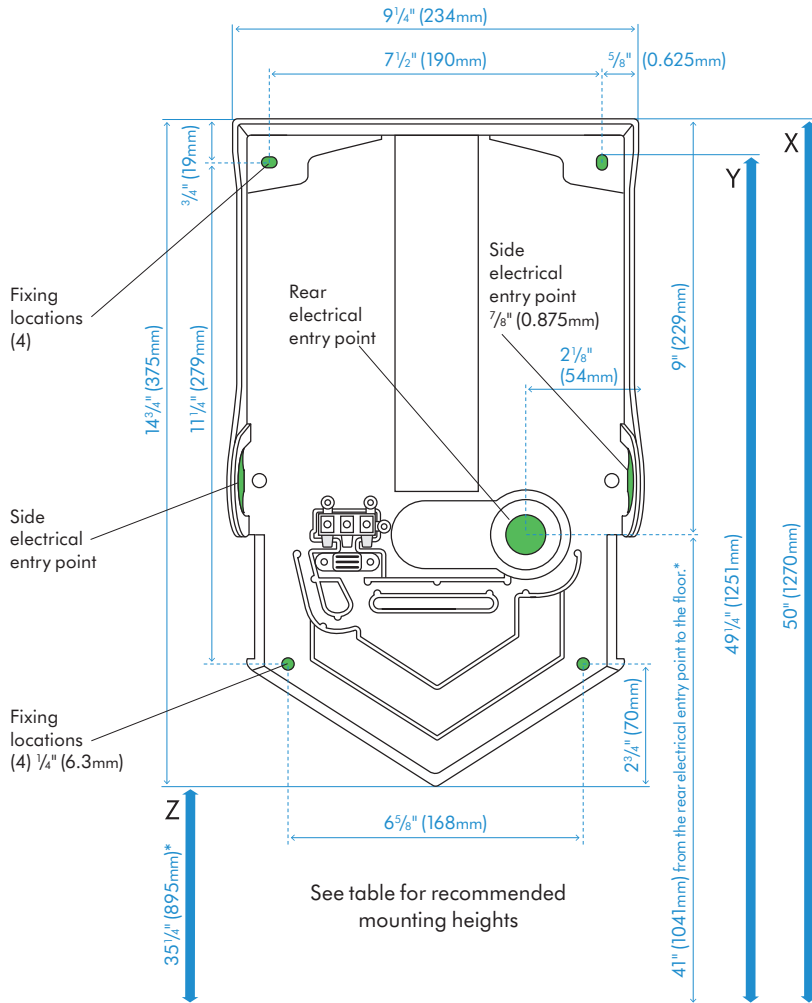


## TECHNICAL SPECIFICATION



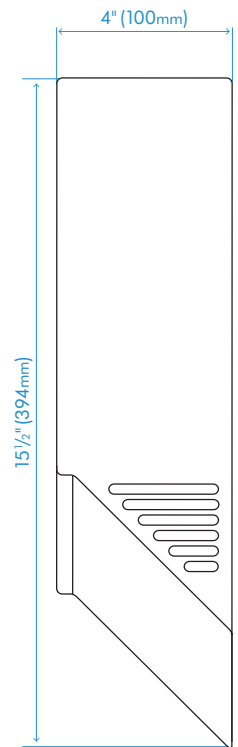
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02

### REAR ELEVATION



See table for recommended mounting heights

### SIDE ELEVATION



Machine fascia shown above in Side Elevation.

All dimensions shown in inches (+/-  $\frac{3}{16}"$ ) and in millimeters (+/- 5mm).

Holes indicated in green area are measured to the center of the hole.

FLOOR

#### Machine dimensions

Height  $15\frac{1}{2}"$  (394mm) × Width  $9\frac{7}{32}"$  (234mm) × Depth  $4"$  (100mm)

#### Minimum clearance

$8\frac{11}{16}"$  (220mm) clearance either side and  $1\frac{3}{16}"$  (30mm) above machine.

#### Recommended installation heights from floor

	X	Y	Z
Adult	$50"$ (1270mm)	$49\frac{1}{4}"$ (1251mm)	$35\frac{1}{4}"$ (895mm)
Wheelchair/child	$48\frac{3}{4}"$ (1238mm)	$48"$ (1219mm)	$34"$ (863mm)

#### Rear cable entry point from floor

Adult	$41"$ (1041mm)
Wheelchair/child	$39\frac{3}{4}"$ (1009mm)

\*Please look into local guidelines for ADA compliance.

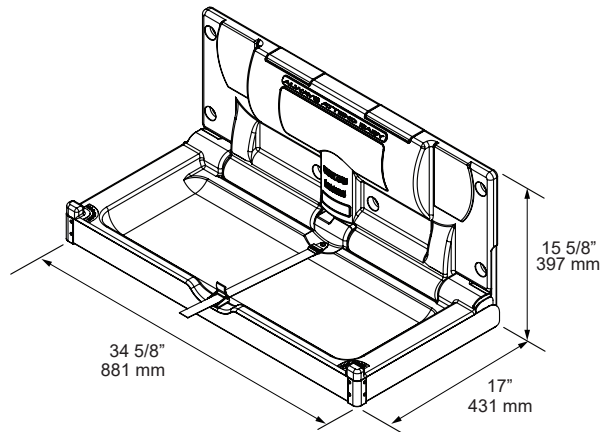


**Foundations®**

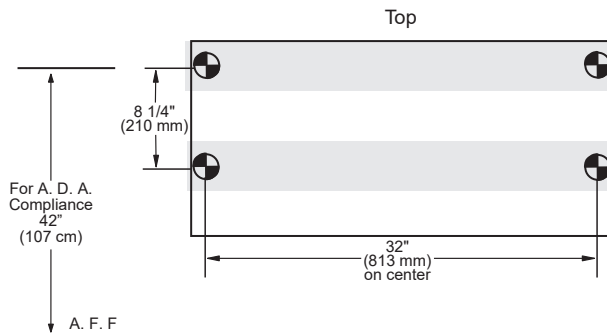
BABY CHANGERS MADE BY BABY EXPERTS.™

# Submittal Sheet

## Model 5410339 Horizontal Diaper Changing Station



### Recommended Blocking



### Short Specifications

Polyethylene Diaper Changing Stations with Stainless Steel Exterior:

1. Acceptable product: Foundations Worldwide, Inc.; Model 5410339
2. Characteristics:
  - a. Type: Molded FDA approved high-density polyethylene (HDPE) body.
  - b. Child protection strap featuring cam-buckle which is adjustable with one hand.
  - c. Smooth nylon belt with Thermoplastic Polyurethane coating. Easy to sanitize and adjustable with one hand.
  - d. Warning labels printed in English, Spanish and French.
  - e. Meets ASTM F2285 requirements for weight bearing Commercial Changing Stations.
  - f. Entire body 18 gauge, 304 brushed stainless steel.
3. **A.D.A. Compliance:**

306.3	Knee Clearance
307.2	Maximum Protruding Objects
308.2	Forward Reach
308.3	Side Reach
309.4	Operation
902.3	Work Surface

Compliant when properly installed.
4. ANSI compliant safety labels.
5. CPSIA compliant to applicable sections.



- Polyethylene body with stainless steel exterior.
- Easy to clean, high-density polyethylene which is naturally bacteria resistant; beneath 304 brushed stainless steel encasement.
- Standard with molded-in dual liner dispensers.
- Each liner dispenser holds approximately 50 of the 036-LCR or 036-NWL liners.
- A.D.A. cam-buckle is adjustable with one hand.
- Smooth nylon belt with Thermoplastic Polyurethane coating. Easy to sanitize and adjustable with one hand.
- Convenient bag hooks clearly labeled on both sides.
- Easy to read ANSI compliant labels (ANSI Z535.3 and ANSI Z535.4), utilizing universal safety symbols.
- Compact, slim profile meets A.D.A. when properly installed. Only protrudes 4 inches or 102 mm from wall.
- Includes universal changing station door sign.
- Pneumatic gas shock mechanism to ensure smooth, safe open and close motions.
- Steel-to-steel support hinges.
- Includes easy to install, step-by-step instructions plus all mounting hardware.
- ASTM G21 Anti-Bacterial: No measurable bacterial growth.
- Meets or exceeds ASTM F2285 Safety Specifications for Commercial Changing Stations.
- Standard pack: 1 unit.
- Limited Warranty: This product is warranted against manufacturing defects for a period of 5 years.

### Installation Information

- Closed unit projects less than 4 inches (101 mm) from wall.
- Open changing surface projects 17 inches (432 mm) from wall during use.
- Overall closed dimensions are 34-5/8 inches (881 mm) wide and 17 inches (432 mm) tall.
- Hardware allows for mounting to current or new construction applications.



**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX D  
LIGHT FIXTURE CUT SHEETS**

## FEATURES & SPECIFICATIONS

**INTENDED USE** — Built on the compact, low-profile Z strip channel, this LED strip offers long maintenance-free life, several color temperatures, lumen outputs and lengths. Ideal for new construction and retrofit applications in T8 lengths. Ideal for use in commercial, retail, manufacturing, warehouse, and display applications. **Certain airborne contaminants can diminish the integrity of acrylic and/or polycarbonate.** [Click here for Acrylic-Polycarbonate Compatibility table for suitable uses.](#)

**CONSTRUCTION** — Compact-design channel and cover are formed from code-gauge cold-rolled steel. Easy to install six-point row aligner included for continuous row mounting.

Finish: Paint options include high-gloss, baked white enamel (WH), or matte black (MB). After fabrication, five-stage iron phosphate pre-treatment ensures superior paint adhesion and rust resistance.

**OPTICS** — Standard diffuse snap on/snap off lens eliminates pixels, improves uniformity and minimizes glare.

**ELECTRICAL** — Utilizes high-output LEDs integrated on a two-layer circuit board, ensuring cool-running operation. Optional internal pluggable wiring harness for reduced labor cost in row mounting applications (see PLR\_ordering information on page 5). Electronic LED driver is rated for 75 input watts maximum (see Operational Data on page 4 for actual wattage consumption), **multi-volt input and 0-10V dimming standard.** This fixture is designed to withstand a maximum line surge of 2.5kV at 0.75kA combination wave for indoor locations, for applications requiring higher level of protection additional surge protection must be provided.

LEDs provide 80CRI or 90 CRI at 3000 K, 3500 K, 4000 K or 5000 K.

Lumen output up to 1,500 lumens per foot. Luminaire should be installed in applications where ambient temperatures do not exceed 86°F (30°C).

**INSTALLATION** — Fixture may be surface mounted (with or without ZSPRG hanger), pendant or stem mounted with appropriate mounting options. Six-point aligner locks in place for easy continuous row mounting.

**LISTINGS** — CSA certified to US and Canadian safety standards. For use in damp locations between -40°F (-40°C) and 86°F (30°C).

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at [www.designlights.org/QPL](http://www.designlights.org/QPL) to confirm which versions are qualified.

**BUY AMERICAN** — Product with the BAA option is assembled in the USA and meets the Buy America(n) government procurement requirements under FAR, DFARS and DOT. Please refer to [www.acuitybrands.com/buy-american](http://www.acuitybrands.com/buy-american) for additional information.

**WARRANTY** — 5-year limited warranty. This is the only warranty provided and no other statements in this specification sheet create any warranty of any kind. All other express and implied warranties are disclaimed. Complete warranty terms located at: [www.acuitybrands.com/support/warranty/terms-and-conditions](http://www.acuitybrands.com/support/warranty/terms-and-conditions)

**Note:** Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

Catalog Number
Notes
Type



LED Striplight

# ZL1D

24", 48" and 96" Lengths



### A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® or control networks marked by a shaded background\*

To learn more about A+, visit [www.acuitybrands.com/aplus](http://www.acuitybrands.com/aplus).

\*See ordering tree for details

# ZL1D LED Striplight



A+ Capable options indicated by this color background.

## ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

**Example:** ZL1D L48 3000LM FST MVOLT 40K 80CRI WH

Series	Length	Reflectors‡	Nominal lumens‡	Diffuser	Voltage	Color temperature	Color rendering index
ZL1D LED striplight	L24 24" ‡	(blank) Less reflector SMR Symmetric	1500LM 1,500 lumens 2500LM 2,500 lumens 3500LM 3,500 lumens	FST Drop lens	MVOLT 120-277V 120 120V 208 208V 240 240V 277 277V 347 347V ‡ 480 480V ‡	30K 3000 K 35K 3500 K 40K 4000 K 50K 5000 K	80CRI 80 CRI 90CRI 90 CRI
	L48 48"	(blank) Less reflector ASR Asymmetric SMR Symmetric	3000LM 3,000 lumens 5000LM 5,000 lumens 7000LM 7,000 lumens				
TZL1D LED striplight ‡	L96 96"	(blank) Less reflector SMR Symmetric	6000LM 6,000 lumens 10000LM 10,000 lumens 14000LM 14,000 lumens				

Options		Individual Controls ‡	Paint finish
PLR__	Plug-in wiring ‡	LBOZU 360° low mount LSXR PIR sensor, (7-15' mounting heights), ON/OFF occupancy, pre-wired (LINK) ‡	WH White
PLR1LVG	Plug-in wiring-low voltage ‡		MB Matte black
E7W	Emergency battery pack, 7W CA Title 20 Noncompliant ‡	LBH0SZU 360° low mount LSXR PIR sensor, (7-15' mounting heights), high/low occupancy dimming, pre-wired (LINK) ‡	GALVB Galvanized fixture with black plastic lens endcaps
2E7W	Two Emergency battery packs, 7W CA Title 20 Noncompliant ‡	LBPZU 360° low mount LSXR PIR sensor, (7-15' mounting heights), ON/OFF photocell, pre-wired (LINK) ‡	GALVW Galvanized fixture with white plastic lens endcaps
E10WLC	Emergency battery pack, 10W Linear Constant Power, Certified in CA Title 20 MAEDBS ‡	LBM0SZU 360° low mount LSXR PIR sensor, (7-15' mounting heights), dimming and switching photocell, pre-wired (LINK) ‡	
2E10WLC	Two Emergency battery packs, 10W Linear Constant Power, Certified in CA Title 20 MAEDBS ‡	<b>Cord sets: ‡</b>	
E15WLC	Emergency battery pack, 15W Linear Constant Power, Certified in CA Title 20 MAEDBS ‡	CS1W Cord with NEMA 5-15P, 120V straight blade plug, 18 gauge, 3 conductors, white, 6ft	
OUTEND	Cord set to exit endplate of fixture	CS3W Cord with NEMA L5-15P, 120V twist lock plug, 18 gauge, 3 conductors, white, 6ft	
BAA	Buy America(n) Act Compliant	CS7W Cord with NEMA 7-15P, 277V straight blade plug, 18 gauge, 3 conductors, white, 6ft	
<b>nLight® Wireless</b>		CS11W Cord with NEMA L7-15P, 277V twist lock plug, 18 gauge, 3 conductors, white, 6ft	
NLTAIR2 RLSXR10	nLight® Air Generation 2 enabled, 360° low mount sensor, (7 to 15' heights) (LINK)	CS25W Cord with NEMA L24-20P, 347V twist lock plug, 18 gauge, 3 conductors, white, 6ft	
NLTAIR2 RLSXR10EM	nLight® Air Generation 2 enabled, 360° low mount sensor, (7 to 15' heights), UL 924 Emergency Operation, via power interrupt detection (not available with battery pack) (LINK) ‡	CS97W Cord with NEMA L8-20P, 480V twist lock plug, 18 gauge, 3 conductors, white, 6ft	
		CS93W Cord only (no plug), 18 gauge, 3 conductors, white, 6ft	

Accessories: Order as separate catalog number.			
HC36 M12	Hanger chain, 36" (1 pair)	ZLR L24 SYM UPL WH	24" symmetric reflector with uplight, white finish
ZACVH M100	Adjustable 10' aircraft cable with Y hanger (1 pair)	ZLR L24 SYM WH	24" symmetric reflector, white finish
ZLANGBKT	Luma-tilt™ angle bracket for shelf or ledge mounting only	ZLR L46 SYM UPL WH	46" symmetric reflector with uplight, white finish
SQ__	Swivel stem hanger (specify length in 2" increments up to 48")	ZLR L46 SYM WH	46" symmetric reflector, white finish
NPP16D	nLight® wired power/relay pack, 0-10VDC dimming output (LINK)	ZLR L48 ASY WH	48" asymmetric reflector, white finish
RPP20D	nLight® air Generation 2 enabled, power/relay pack, 0-10V dimming output (LINK)	ZLR L48 SYM UPL WH	48" symmetric reflector with uplight, white finish
LSXR	Sensor Switch® LSXR occupancy sensor (LINK)	ZLR L48 SYM WH	48" symmetric reflector, white finish
ZSPRG J2	Tong and T-grid hanger, for 15/16" T-grid (Order quantity required in multiples of 2)	ZLR L92 SYM UPL WH	92" symmetric reflector with uplight, white finish
WGZ24	24" wireguard, white ‡	ZLR L92 SYM WH	92" symmetric reflector, white finish
WGZ48	48" wireguard, white ‡	ZLR L96 SYM UPL WH	96" symmetric reflector with uplight, white finish
		ZLR L96 SYM WH	96" symmetric reflector, white finish
		UNIVERSAL REFL ALIGNER	Universal reflector aligners, quantity 1

# ZL1D LED Striplight

‡ Option Value Ordering Restrictions	
Option value	Restriction
2E7W	Utilizes (2) Power Sentry PS750L emergency drivers. MVOLT required. Available with L96 only. Not available with L24, L48, L96 6000LM or any cordset that includes a plug.
2E10WLCP	Utilizes (2) Power Sentry PS1055LCP emergency drivers. MVOLT required. Available with L96 10,000LM or 14000LM only. Not available with L24, L48, L96 6000LM or any cordset that includes a plug.
347, 480	Utilizes step down transformer.
Cordsets	Must specify voltage when plug is included. CS93W available with MVOLT. Cordsets exit back of fixture unless OUTEND option is specified.
E7W	Utilizes Power Sentry PS750L emergency driver. MVOLT required. Not available with L24 or any cordset that includes a plug.
E10WLCP	Utilizes Power Sentry PS1055LCP emergency driver. MVOLT required. Available with L48 or L96 only. Not available with L24 or any cordset that includes a plug.
E15WLCP	Utilizes Power Sentry PS1555LCP emergency driver. MVOLT required. Available with L96 only. Not available with L24, L48 or any cordset that includes a plug.
Individual Controls	Available with MVOLT, 347 or 480 only. See ordering information on page 6 for more configurations. This sensor configuration is suitable for minimum ambient temperature of 14°F (-10°C). See page 6 for low temperature option providing -4°F (-20°C) minimum ambient. When choosing Sensor and PLR for same fixture, consult the factory. Sensors come prewired, they must be snapped into place at time of installation.
L24	Not available with 347V, 480V or Batteries
nLight® Wireless	See (LINK) in sensor description to RLSXR specification sheet for more configurations. When choosing a sensor and PLR for same fixture, consult the factory. Sensors come prewired, they must be snapped into place at time of installation.
NLTAIR2 RLSXR10EM	MVOLT only.
Nominal Lumens	See Operational Data on page 4 for actual lumens.
PLR __	Not available with cordset options. See ordering information on page 5. When choosing a sensor and PLR for the same fixture, consult the factory.
PLR1LVG	Not available with cordset options.
Reflectors	Optional. Reflectors ship separately.
TZL1D	Tandem fixture comes as two L48 fixtures
WGZ24	Not available with ASR or SMR reflector options.
WGZ48	Not available with ASR or SMR reflector options. Order a Qty of 2 for L96 tandem fixtures.

# ZL1D LED Striplight

## OPERATIONAL DATA

	Nominal lumen package	Length (inches)	Delivered Lumens 3000K CCT @ 77°F (25°C) ambient temperature		Delivered Lumens 3500K CCT @ 77°F (25°C) ambient temperature		Delivered Lumens 4000K CCT @ 77°F (25°C) ambient temperature		Delivered Lumens 5000K CCT @ 77°F (25°C) ambient temperature		Wattage @ 120V/277V	Comparable Light Source
			80 CRI	90 CRI	80 CRI	90 CRI	80 CRI	90 CRI	80 CRI	90 CRI		
Lensed	1500LM	24	1985	1619	2030	1675	2061	1707	2137	1745	17	1-lamp 17W T8
	2500LM	24	2682	2187	2742	2264	2785	2307	2887	2358	22	1-lamp 17W T8
	3500LM	24	4099	3341	4190	3459	4255	3524	4412	3603	36	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	3000LM	48	3880	3163	3966	3274	4028	3336	4176	3410	30	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	5000LM	48	5337	4351	5456	4504	5541	4589	5745	4691	41	2-lamp 32W T8, 1-lamp 54W T5HO, 70W HID
	7000LM	48	7317	5965	7480	6175	7596	6291	7876	6431	59	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	6000LM	96	8077	6585	8257	6816	8386	6945	8694	7099	60	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	10000LM	96	11021	8985	11267	9301	11442	9477	11864	9687	81	4-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	14000LM	96	15397	12553	15741	12995	15986	13240	16574	13534	121	4-lamp 32W T8, 3-lamp 54W T5HO, 150W HID

## PROJECTED LUMEN MAINTENANCE

Operating Hours	0	15,000	30,000	45,000	60,000	100,000
Lumen Maintenance Factor	1	0.94	0.89	0.83	0.79	0.67

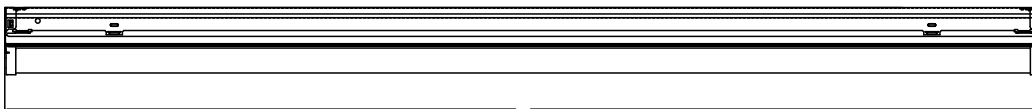
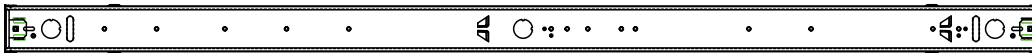
## DIMENSIONS

All dimensions are shown in inches (centimeters) unless otherwise noted.

Specifications subject to change without notice.

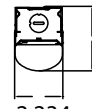
### PALLET DIMENSIONS

Length	Approximate weight	Fixtures per pallet	Approximate pallet dimensions (L x W x H)
L24	7 lbs.	176	46" X 51" X 31 5/8"
L48	13 lbs.	176	46" X 51" X 31 5/8"
L96	26 lbs.	63	46" X 98 1/2" X 31 3/8"



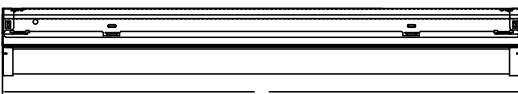
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ZL1D L48



2.9882

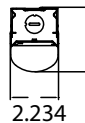
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24.028

ZL1D L24

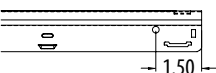
Knockout hole is .86in in diameter.



2.9882

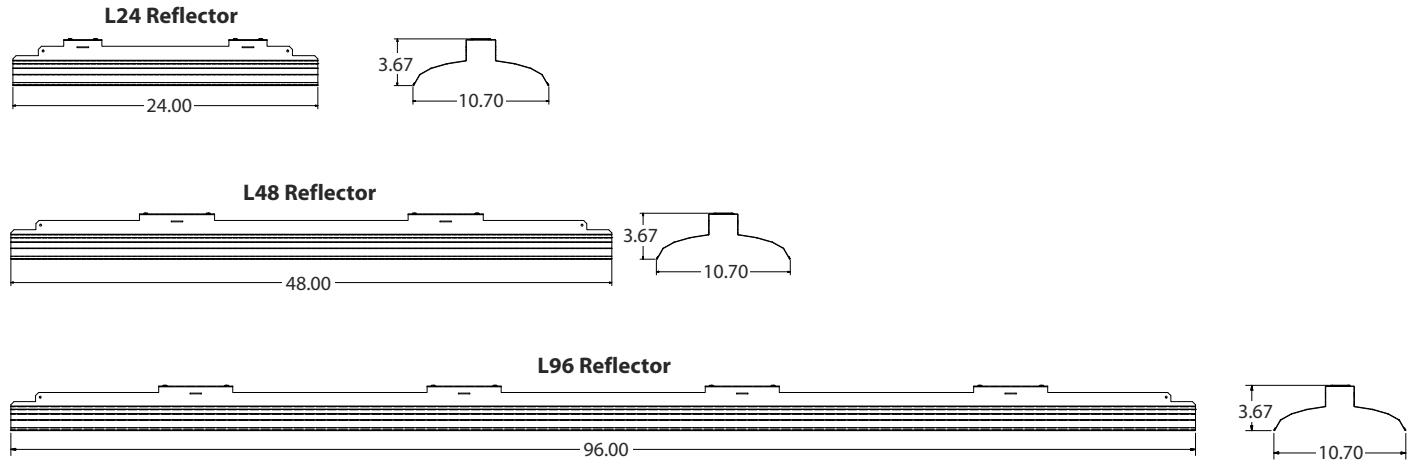
2.234

Mounting Hole Location - All Lengths



# ZL1D LED Striplight

## REFLECTORS (Optional)



## PHOTOMETRICS

Please see [www.lithonia.com](http://www.lithonia.com)

## PLUG-IN WIRING INFORMATION

Advanced plug-in system with two-circuit capability. Available on industrial and strip products and a variety of architectural products mounted in continuous rows. PLR22 (2-circuit) and crossover harness switches hot circuit serving next fixture in row. Reduces fixture types on job for alternating circuit applications (see example below.)

Easy one-step installation, saves up to 35% on labor costs. Expanded switching flexibility helps save energy.

Rows can be 50% longer with two-circuit systems. Polarized, lock-together nylon connectors prevent miswiring in the field. #12 THHN conductor, rated 600V, 90°C. White neutral wire included. Grounding accomplished by fixture in-row connectors.

CSA certified systems available with up to 2 circuits. G ground required.

Not for use with dedicated emergency circuits.

Note: Specifications subject to change without notice.



**PLR**

Wiring

Advanced 1 or 2-Circuit Plug-In

### ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Series	Number of hot wires	Branch circuits	Dimming	Ground
PLR	(blank) Not required for PLR22	<u>Circuits to which driver is connected</u>	LV Low-voltage dimming	G Ground (required)
PLR22	1 Black 2 Black and red	(blank) Not required for PLR22 or PLR1 A Black wire B Red wire		
		<u>Battery charging circuit (must be unswitched)</u> (blank) No battery charging circuit ELA Battery pack circuit wired to black wire ELB Battery pack circuit wired to red wire		

### Typical Applications

- Multiple-circuit and single-circuit for longer continuous rows
- Multiple-circuit with alternating fixtures on separate circuits and 2-circuit PLR22
- Multiple circuit with night-lights located along row as desired

# ZL1D LED Striplight

## LSXR — Fixture Mount Occupancy Sensor (see [www.AcuityControls.com](http://www.AcuityControls.com) for additional information)

- Three interchangeable lens options to satisfy multiple mounting heights and coverage pattern requirements.
- Integrated mounting bracket drops lens down 3" from chase nipple.
- Single or dual relay versions — designed with robust protection from the harsh switching requirements of T5 and LED loads.
- Photocell and 0-10VDC dimming options.
- No PIR field calibration or sensitivity adjustments required.
- Sensor ambient temperature rating of 14°F (-10°C) to 131°F (55°C).

LSXR configuration	Comparable CMRB sensor	Old style sensor nomenclature
<b>For shortest lead times use one of the following LSXR configurations</b>		
LCOZU	CMRB 50	MSI
LCH0SZU	CMRB 50 D	MSID
LCPZU	CMRB 50 P	MSIPED
LAOZU	CMRB 6	MSI360
LAH0SZU	CMRB 6 D	MSI360D
LAPZU	CMRB 6 P	MSI360PED

**SELECTIONS BELOW WILL EXTEND ORDER LEAD TIME. CONSULT YOUR SALES REPRESENTATIVE FOR DETAILS.**

### SINGLE RELAY

#### ORDERING INFORMATION

**Example:** LAH0SZU

Series	Lens option	Dimming/Photocell	Max. dim level	Min. dim level	Temp/Humidity	Default occupancy time delay
L LSXR passive infrared indoor occupancy sensor	A High mount, 360°	O None <sup>1</sup>	0 10 VDC	S Minimum dim level of ballast	Z None	I 30 sec
		H High/low occupancy operation	9 9 VDC	1 1 VDC	T Low temperature <sup>2</sup>	D 2.5 min
	B Low mount, 360°	P Switching photocell (on/off) <sup>1</sup>	8 8 VDC	2 2 VDC		X 5.0 min
		M Dimming and switching photocell	7 7 VDC	3 3 VDC		R 7.5 min
	C High mount aisleway	G Dimming and switching photocell with high/low occupancy operation		4 4 VDC		U 10.0 min (with minimum 15 minute on time)
				5 5 VDC		V 15.0 min
				6 6 VDC		W 20.0 min
					Y 30.0 min	

#### Notes

- 1 Max and min dim levels not applicable with this option.
- 2 Ambient temperature rating of -4°F (-20°C) to 131°F (55°C).

### DUAL RELAY (Available with 120, 277, and 347V only)

#### ORDERING INFORMATION

**Example:** LA2KZU

Series	Lens option	Poles	Operating mode	Temp/Humidity	Default occupancy time delay
L LSXR passive infrared indoor occupancy sensor	A High mount, 360°	2 Dual relay	J None	Z None	I 30 sec
			K Alternating off relays (promotes even lamp wear)	T Low temperature <sup>1</sup>	D 2.5 min
	O Alternating off relays w/photocell			X 5.0 min	
	P Switching photocell(on/off)			R 7.5 min	
	E Photocell on/off (pole 1 only)			U 10.0 min (with minimum 15 minute on time)	
	F Photocell on/off - both poles (dual set-point)			V 15.0 min	
					W 20.0 min
					Y 30.0 min

#### Notes

- 1 Ambient temperature rating of -4°F (-20°C) to 131°F (55°C).

**Example:** LENS 50 J100

Replacement lenses: Order as separate catalog number.		
Series	Lens type	Package quantity
LENS	6 High mount 360°	[blank] Single Lens
	10 Low mount 360°	J10 10-pack
	50 High mount aisleway	J100 100-pack

## OPTIONS AND ACCESSORIES

The Z Series fixture offers numerous options for almost every electrical and optical component, including a long list of field-installable accessories.

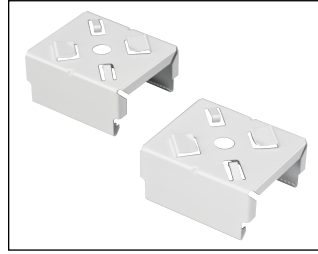


### HANGER CHAIN

36" chain with Y hanger.

Order as:

HC36

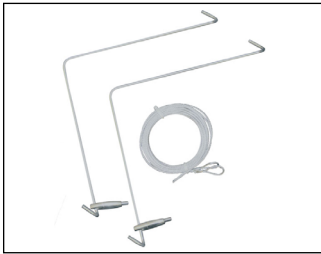


### Z SPRING HANGER

Snap 'n' lock design requires no fasteners and can be used on T-grid ceiling or universal mounting systems.

Order as:

ZSPRG

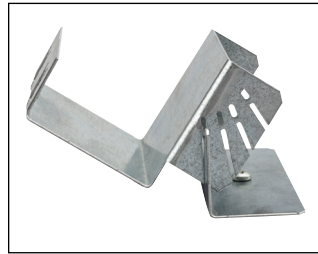


### ZACVH HANGER

10' Aircraft cable with Y hanger.

Order as:

ZACVH

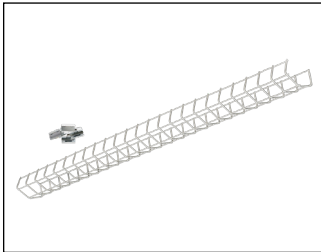


### ANGLE MOUNTING BRACKET

Luma-tilt™ angle bracket ships as a pair

Order as:

ZLANGBKT



### WIRE GUARD

Order as:

WGZ24

WGZ48



PA



# Eau™

PENDANT


**FEATURES**

- AVAILABLE IN 80+ CRI AND 90+ CRI (R9>50)
- THE EAU WAS INSPIRED BY THE FLUIDITY OF FALLING DROPS OF WATER
- A SIMPLE GLASS GLOBE IS CAPPED OFF WITH A 0.064" THICK ALUMINUM SPINNING TO CELEBRATE THE CONNECTION BETWEEN THE GLASS AND THE SIMPLE CORD THAT SUSPENDS IT
- ALL OF THE ELEMENTS OF THIS FIXTURE FLOW TOGETHER WITH NO VISIBLE HARDWARE
- FEATURES HAND-BLOWN, OPAL WHITE GLASS WITH A MINIMUM WALL THICKNESS OF 0.150"



**CATALOG CODES**

<b>EU1</b>	<b>B</b>	<b>C</b>	<b>WG</b>	<b>E</b>	<b>F</b>	<b>UNV</b>	<b>H</b>	<b>DM1</b>	<b>J</b>
SERIES	HANGING SYSTEM	SIZE	DIFFUSER	FINISH	LIGHT SOURCE	VOLTAGE	OAH	CONTROL	OPTIONS

SPECIFY CATALOG CODE									
A	B		C	D		E			J
SERIES	HANGING SYSTEM		SIZE	DIFFUSER		FINISH			OPTIONS
 <b>EU1</b> EAU	<b>MOUNTING TYPE</b> <b>P1CB</b> PENDANT WITH SURFACE MOUNT CANOPY, SINGLE POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS)	<b>CORD COLOR</b> <b>B</b> BLACK POWER CORD <b>W</b> WHITE POWER CORD	<b>12</b>	<b>WG</b> WHITE GLASS	<b>POWDER COAT FINISHES</b> <b>BKP</b> BLACK <b>BMP</b> BRASS METALLIC <b>BNP</b> BRONZE <b>BTP</b> BLACK TEXTURED <b>GRP</b> GRAPHITE <b>GLP</b> GOLDTASTIC	<b>MWP</b> MATTE WHITE <b>SGP</b> STEEL GRAY <b>SMP</b> SILVER METALLIC <b>SWP</b> SKY WHITE <b>WTP</b> WHITE TEXTURED	<b>PREMIUM METAL FINISHES</b> <b>BAL</b> BRUSHED ALUMINUM		
			<b>14</b>						
			<b>16</b>						
F			G	H	I	J			
LIGHT SOURCE			VOLTAGE	OAH	CONTROL	OPTIONS			
<b>LED OUTPUT</b>	<b>COLOR TEMP</b> (80+ CRI)	<b>COLOR TEMP</b> (90+ CRI)	<b>UNV 120-277</b>	<b>48</b> <b>100</b> <b>144</b>	<b>DM1</b> 0-10V DIMMING 1%	<b>ULD</b> DAMP LABEL <b>MOD</b> MODIFIED LUMINAIRE (CONTACT LOCAL REP)			
<b>LED1</b>	<b>27K</b>	<b>927K</b>							
<b>LED2</b>	<b>30K</b>	<b>930K</b>							
<b>LED3</b>	<b>35K</b>	<b>935K</b>							
	<b>40K</b>	<b>940K</b>							
<b>SAMPLE CODE: EU1-P1CBW-14-WG-WTP-LED1/27K-UNV-48-DM1</b>									

**MODS, NOTES, & COMMENTS**

UP TO **74** LM/W

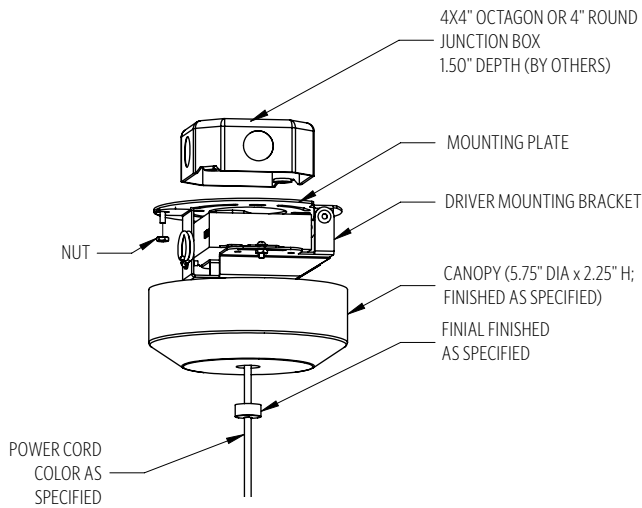
**LUMENS AND WATTAGE CHART**

		12"	14"	16"
<b>LED1</b>	LUMENS DELIVERED	1080	1080	1080
	SYSTEM WATTAGE	14	14	14
<b>LED2</b>	LUMENS DELIVERED	1540	1540	1540
	SYSTEM WATTAGE	21	21	21
<b>LED3</b>	LUMENS DELIVERED	2100	2100	2100
	SYSTEM WATTAGE	29	29	29

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp. Wattage and lumen data approx. pending LM-79 testing. Values shown for 80+ CRI. For 90+ CRI lumens use 0.85 multiplier.

## HANGING SYSTEM

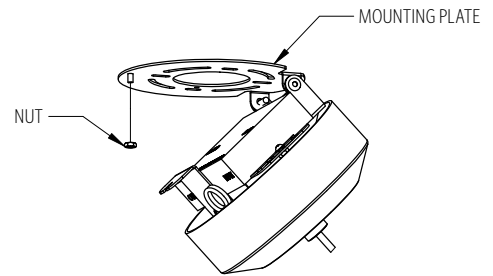
**PICB** PENDANT WITH SURFACE MOUNT CANOPY, SINGLE POWER CORD;  
MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS)



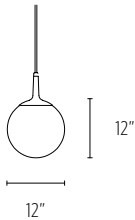
### MOUNTING INFORMATION CHART

LUMINAIRE SIZE	LUMINAIRE WEIGHT	MIN/MAX OAH
12"	9 LBS	24"/144"
14"	11 LBS	26"/144"
16"	12 LBS	28"/144"

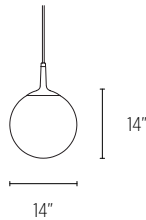
PICB ships with one of three OAH's (48", 100" or 144") and is field adjustable to the desired height.



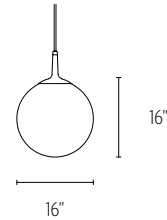
## SIZES



FIXTURE WEIGHT **9 LBS**



FIXTURE WEIGHT **11 LBS**



FIXTURE WEIGHT **12 LBS**

## DIFFUSER



**WG** WHITE GLASS

## FINISH

### METALLIC POWDER COAT FINISHES:



**SMP**  
SILVER



**GRP**  
GRAPHITE



**SGP**  
STEEL GRAY



**GLP**  
GOLDTASTIC



**BMP**  
BRASS



**BNP**  
BRONZE

### PREMIUM METAL FINISHES:



**BAL**  
BRUSHED ALUMINUM

### SOLID POWDER COAT FINISHES:



**SWP**  
SKY WHITE



**MWP**  
MATTE WHITE



**BKP**  
BLACK

### TEXTURED POWDER COAT FINISHES:



**BTP**  
BLACK TEXTURED



**WTP**  
WHITE TEXTURED

**RAL®, Pantone® or custom finishes are also available.**

These colors are for reference only. Please be aware that colors may vary per monitor. Contact your local rep for finish samples or with any questions.

## LIGHT SOURCE

### LUMENS AND WATTAGE CHART

		12"	14"	16"
<b>LED1</b>	LUMENS DELIVERED	1080	1080	1080
	SYSTEM WATTAGE	14	14	14
<b>LED2</b>	LUMENS DELIVERED	1540	1540	1540
	SYSTEM WATTAGE	21	21	21
<b>LED3</b>	LUMENS DELIVERED	2100	2100	2100
	SYSTEM WATTAGE	29	29	29

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp. Wattage and lumen data approx. pending LM-79 testing. Values shown for 80+ CRI. For 90+ CRI lumens use 0.85 multiplier.

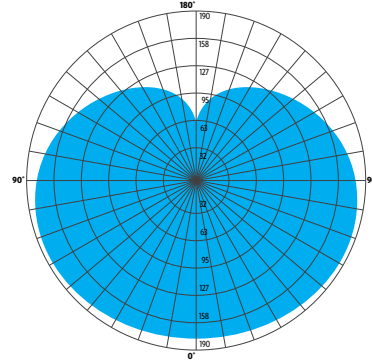
### PHOTOMETRY:

FIXTURE:	EU1-PICA-16
COLOR TEMP #:	3500K
OUTPUT:	1500
EFFICACY:	74 LM/W
TEST REPORT:	TEST NO. 20014

For all available IES files, please visit our website at [ocl.com](http://ocl.com).

STANDARD COLOR TEMPERATURE OPTIONS	CRI (RA)	
2700K	80+	90+
3000K	80+	90+
3500K	80+	90+
4000K	80+	90+

ZONE	LUMENS	% OF LUMINAIRE
0-30	147	7%
0-60	562	27%
0-90	1141	54%
90-180	955	46%



EU1

## CONTROL

### DM1 0-10V DIMMING DOWN TO 1%

- 0-10V DIMMING
- 1% MINIMUM DIMMING LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MIN AMBIENT OPERATING TEMPERATURE = -31°F
- FIELD REPLACEABLE

## OPTIONS

### ULD DAMP LABEL LUMINAIRE

- MAY BE USED IN AN OUTDOOR AREA THAT IS PROTECTED FROM DIRECT CONTACT WITH WIND, RAIN, SNOW OR EXCESSIVE MOISTURE

### MOD MODIFIED LUMINAIRE

- LUMINAIRE IS MODIFIED FROM STANDARD OPTIONS; CONTACT LOCAL REP FOR MORE INFORMATION

## SPECIFICATIONS

### CONSTRUCTION

- FIXTURE IS SPUN, EXTRUDED, AND MACHINED ALUMINUM WITH A MINIMUM WALL THICKNESS OF 0.064"
- HAND-BLOWN, OPAL WHITE GLASS WITH A MINIMUM WALL THICKNESS OF 0.150"
- HANGING SYSTEMS USE STEEL OR ALUMINUM CANOPIES
- HARDWARE IS ZINC PLATED OR STAINLESS STEEL

### MOUNTING

- **PICB** MOUNTS TO 4X4" OCTAGON OR 4" ROUND J-BOX (BY OTHER)

### ELECTRICAL

- DIMMING ELECTRONIC DRIVER(S), COMES STANDARD WITH 0-10V DOWN TO 1%
- 0-10V DOWN TO 0.1% AND LUTRON ECOSYSTEM (LDE1) 1% ALSO AVAILABLE AS MODIFICATION
- BRIDGELUX COB
- LUMINAIRE CONNECTS TO BUILDING SUPPLY (120V-277V 50/60HZ) UNLESS DRIVERS ARE REMOTE

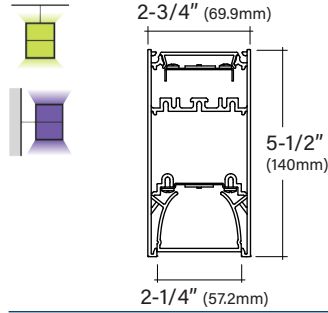
### LISTING

- ETL LISTED TO UL 1598 FOR DRY LOCATIONS; DAMP LOCATION LISTED IS OPTION

### WARRANTY

- 5 YEAR; ALL ELECTRICAL COMPONENTS RETAIN THE MANUFACTURER'S WARRANTY

The drawings and specifications and ideas, designs and arrangements represented on these drawings are and shall remain the property of The Original Cast Lighting (OCL Architectural Lighting) and no part thereof shall be copied, disclosed, to others or used in conjunction with any work or project other than the specified project for which they have been prepared and developed, without written consent of OCL. Visual contact with these plans or specifications shall constitute conclusive evidence of acceptance of these restrictions. All specifications and information subject to change without notice.



# EDGE EX2DI

## 2" Suspended Direct/Indirect Linear

### Key Features

- 6063-T6 Extruded aluminum housing
- Highly reflective white painted reflector
- Room-Side Maintenance for LED system
- 5-year limited warranty covers LED, driver and fixture
- ETL Listed conforming to UL1598 in US and CSA 250 in Canada
- Approved for dry/damp location unless otherwise noted
- Maximum weight is 25 lbs. for a standard 4' fixture
- Buy American Act compliant
- Indigo-Clean available, see Indigo-Clean specification sheets for details



Example Part #: EX2DI-BW-HE-830HO-830-26'-AC48G1-U-OL2-1-0-W

<b>EX2DI</b>	DIRECT SHIELDING	INDIRECT SHIELDING	DIRECT SOURCE	INDIRECT SOURCE	LENGTH OR PATTERN	MOUNTING	VOLTAGE	DRIVER	CIRCUITING	BATTERY & EMERGENCY	FINISH	FIXTURE OPTIONS	CONTROLS
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DIRECT SHIELDING		INDIRECT SHIELDING		DIRECT SOURCE QS <sup>1</sup>				INDIRECT SOURCE QS <sup>1</sup>					
<b>A</b> - Satine Lens QS <sup>1</sup> <b>AL</b> - Drop Lens <b>HE</b> - High Efficiency QS <sup>1</sup> <b>BW</b> - Batwing QS <sup>1</sup> <b>WHE</b> - Asymmetric QS <sup>1</sup> <b>HED</b> - Descent <b>MOD</b> - Mod options available <i>Shielding pg. 2</i>		<b>HE</b> - High Efficiency QS <sup>1</sup> <b>BW</b> - Batwing QS <sup>1</sup> <b>WHE</b> - Asymmetric QS <sup>1</sup> <b>HEA</b> - Ascent <b>MOD</b> - Mod options available <i>Shielding pg. 2</i>		<b>27</b> - 2700K <b>30</b> - 3000K <b>35</b> - 3500K (available as BIOS) <b>40</b> - 4000K (available as BIOS) <b>TW3</b> - Tunable White (Blanco 3) <b>CL</b> - Custom Lumens <b>CW</b> - Custom Watts <b>MOD</b> - Mod options available <i>Lumen Output pg. 2-3</i>				<b>27</b> - 2700K <b>30</b> - 3000K <b>35</b> - 3500K (available as BIOS) <b>40</b> - 4000K (available as BIOS) <b>TW3</b> - Tunable White (Blanco 3) <b>CL</b> - Custom Lumens <b>CW</b> - Custom Watts <b>MOD</b> - Mod options available <i>Lumen Output pg. 3-4</i>					

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LENGTH OR PATTERN <sup>2</sup>		MOUNTING <sup>3</sup>		VOLTAGE	DRIVER	CIRCUITING
<b>---</b> - Individual Fixture QS <sup>1</sup> <b>---</b> - Continuous Row QS <sup>1</sup> <b>L_x</b> - L Shape QS <sup>1</sup> <b>R_x</b> - Rectangle QS <sup>1</sup> <b>S</b> - Square QS <sup>1</sup> <b>U_x_x</b> - U-Shape QS <sup>1</sup> <b>T_x</b> - T Shape <b>X_x_x</b> - X Shape <b>MOD</b> - Mod options available <i>Length and Pattern pg. 4-5</i>		<b>_AC_G</b> - (M)AC to Grid QS <sup>1</sup> <b>_AC_JB</b> - (M)AC to J Box QS <sup>1</sup> <b>_AC_ST</b> - (M)AC to Structure QS <sup>1</sup> <b>_AC5_G</b> - 5" Non-Power Canopy <b>_AC5_JB</b> - 5" Non-Power Canopy <b>_SQ_G</b> - 5" Square Canopy <b>_SQ_JB</b> - 5" Square Canopy <b>WA</b> - Wall Mount QS <sup>1</sup> <b>MOD</b> - Mod options available <i>Mounting pg. 6</i>		<b>U</b> - Universal QS <sup>1</sup> <i>(120 thru 277V)</i> <b>1</b> - 120V QS <sup>1</sup> <b>2</b> - 277V QS <sup>1</sup> <b>3</b> - 347V <i>Voltage pg. 6</i>	<b>FSD</b> - Factory Select Driver (1%, 0-10v) QS <sup>1</sup> <b>PL2</b> - Advance Xitanium (1%, 0-10v) QS <sup>1</sup> <b>OL4</b> - Osram 347V (1%, 0-10v) <b>EE1</b> - eldoLED ECOdrive (1%, 0-10v) <b>ES1</b> - eldoLED SOLOdrive (0%, 0-10v) <b>LH1</b> - Lutron Hi-lume (1%, EcoSystem) <b>PR1</b> - Advance Xitanium SR <b>OL2</b> - Osram (1%, 0-10v) QS <sup>1</sup> <b>MOD</b> - Mod options available <i>Driver pg. 7</i>	<b>1</b> - Single Circuit QS <sup>1</sup> <b>2</b> - Dual Circuit <b>M</b> - Multi Circuit <b>E</b> - Emergency QS <sup>1</sup> <i>(entire fixture)</i> <b>N</b> - Night Light QS <sup>1</sup> <i>(entire fixture)</i> <i>Circuiting pg. 7</i>

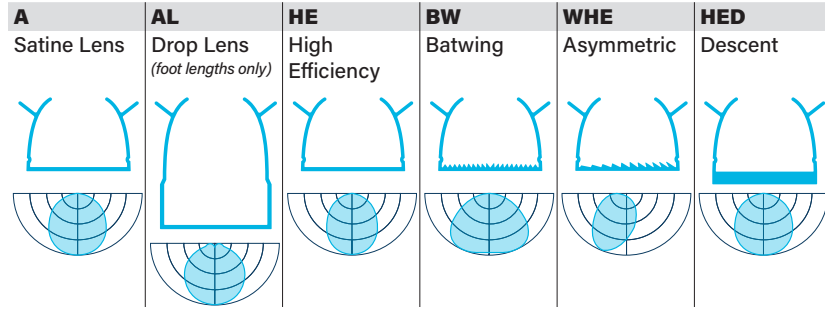
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BATTERY & EMERGENCY <sup>4</sup>		FINISH	FIXTURE OPTIONS <sup>5</sup>	CONTROLS <sup>6</sup>
<b>0</b> - None QS <sup>1</sup> <b>_FSG</b> - Factory Select ALCR <b>_GI</b> - Iota ETS DR <b>_GB</b> - Bodine GTD <b>_PLL</b> - Bodine 10W <b>_ILL</b> - Iota 10W QS <sup>1</sup> <b>MOD</b> - Mod options available <i>Battery and Emergency pg. 8</i>		<b>W</b> - White QS <sup>1</sup> <b>S</b> - Metallic Silver QS <sup>1</sup> <b>BL</b> - Textured Black QS <sup>1</sup> <b>BR</b> - Bronze <b>GR</b> - Graphite <b>CC</b> - Custom Color <i>Finish pg. 8</i>	<b>QS</b> - QuickShip QS <sup>1</sup> <b>DSP</b> - Customer Supplied Battery/Driver/Sensor <b>MOD</b> - Mod options available <i>Fixture Options pg. 8</i>	<b>DLMFC</b> - Wattstopper DLM (wired) <b>DLMFS</b> - Wattstopper LLLC (wireless) <b>EASYS</b> - Philips EasySense (wireless) <b>SNSLM</b> - Encelium Sensilum (wireless) <b>WVLX</b> - Eaton Wavelinx (wireless) <b>VDO</b> - Lutron Vive Sensor (wireless) <b>VRF</b> - Lutron Vive Connected (wireless) <b>ENL</b> - Enlighted (wireless) <b>MOD</b> - Mod options available <i>Controls pg. 9</i>

1. When specifying SOURCE the first \_ is for specifying either 8 - 80CRI, or 9 - 90CRI. The ending \_ \_ are for specifying output, example HO - High Output. If specifying QS output is 80 CRI, all color temperatures, all lumen packages. Does not include Tunable White. See output charts for more information. 2. Individual fixtures come in 2', 3', 4', 5', 6', 7' & 8' lengths. Continuous row come in 1/8" increments. For Mod layouts specify pattern shape and overall dimensions. Example: L6x4: L pattern that is 6'x4'. 3. Specify AC Cable: Standard single AC = AC or Movable AC = MAC; Specify AC length standard AC is 48"; Specify grid: G1=15/16", G9=9/16", GS=Screw Slot. Example: AC48G1 4. Enter quantity for Battery and Emergency, Example 2P. 5. QS must be used in fixture options section of part number to qualify. 1/8" increments not available for QS. LMRP option only available with 120v. 6. Controls can only be used with Single Circuit (1) or Emergency Circuit (E). See Controls chart on page 5 for driver options and more information.

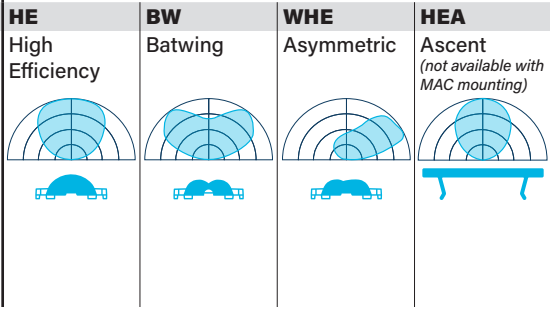
Specifications and dimensions subject to change without notice. Specification sheets that appear on pinnacle-ltg.com are the most recent version and supersede all other previously printed or electronic versions.



Direct Shielding



Indirect Shielding



Shielding: MOD Options

- Specify **MOD** in the part number for any of the below options
- MOD specifications are subject to longer lead-times. Consult factory for more information

**MOD** Clear lens overlay

Direct Source: White LED<sup>1</sup>

- Specify either 80 or 90 CRI
- Longer lead-time may apply for 90 CRI. Consult factory
- 80 CRI = R9≥19 and 90 CRI = R9≥61

Custom Output - Lumens OR Wattage

<b>CL</b> _____	Specify CRI, CCT and desired lumens (i.e. CL835500)	Specify lumens between standard offering listed below. Lumens are specified per color temp
<b>CW</b> _____	Specify CRI, CCT and desired wattage (i.e. CW9407)	Specify watts between standard offering listed below

80 CRI

	Color	Lumens per foot	Shielding <sup>1</sup>											
			<b>A</b>		<b>AL</b>		<b>HE</b>		<b>BW</b>		<b>WHE</b>		<b>HED</b>	
			Satine LPW	Watts/ft	Drop LPW	Watts/ft	High Efficiency LPW	Watts/ft	Batwing LPW	Watts/ft	Asymmetric LPW	Watts/ft	Descent LPW	Watts/ft
<b>830</b>	3000K	500	101	4.9	101	4.9	119	4.2	119	4.2	116	4.3	98	5.1
<b>830HO</b>	3000K	750	101	7.4	103	7.3	119	6.3	119	6.3	116	6.5	99	7.6
<b>830VHO</b>	3000K	1000	103	9.8	105	9.5	122	8.2	122	8.2	119	8.4	99	10.1
<b>835</b>	3500K	500	102	4.9	105	4.8	123	4.1	123	4.1	120	4.2	101	5.0
<b>835HO</b>	3500K	750	104	7.2	107	7.0	123	6.1	123	6.1	120	6.3	101	7.5
<b>835VHO</b>	3500K	1000	106	9.4	107	9.3	126	8.0	126	7.9	123	8.2	102	9.8
<b>840</b>	4000K	500	102	4.9	105	4.8	123	4.1	123	4.1	120	4.2	101	5.0
<b>840HO</b>	4000K	750	104	7.2	107	7.0	123	6.1	123	6.1	120	6.3	101	7.5
<b>840VHO</b>	4000K	1000	106	9.4	107	9.3	126	8.0	126	7.9	123	8.2	102	9.8

90 CRI

<b>927</b>	2700K	500	82	6.1	83	6.0	99	5.1	99	5.1	96	5.2	79	6.4
<b>927HO</b>	2700K	750	84	9.0	85	8.8	98	7.6	99	7.6	98	7.7	80	9.3
<b>927VHO</b>	2700K	1000	82	12.2	83	12.0	100	10.0	100	10.0	97	10.3	79	12.7
<b>930</b>	3000K	500	89	5.6	91	5.5	105	4.7	106	4.7	103	4.9	86	5.8
<b>930HO</b>	3000K	750	91	8.3	93	8.1	108	7.0	108	7.0	105	7.1	88	8.5
<b>930VHO</b>	3000K	1000	90	11.1	92	10.8	108	9.3	108	9.2	107	9.4	86	11.6
<b>935</b>	3500K	500	89	5.6	91	5.5	105	4.8	105	4.8	103	4.9	86	5.8
<b>935HO</b>	3500K	750	90	8.3	92	8.1	107	7.0	107	7.0	105	7.2	88	8.6
<b>935VHO</b>	3500K	1000	90	11.1	92	10.9	108	9.3	108	9.3	106	9.4	86	11.7
<b>940</b>	4000K	500	89	5.6	91	5.5	105	4.8	105	4.8	103	4.9	86	5.8
<b>940HO</b>	4000K	750	90	8.3	92	8.1	107	7.0	107	7.0	105	7.2	88	8.6
<b>940VHO</b>	4000K	1000	90	11.1	92	10.9	108	9.3	108	9.3	106	9.4	86	11.7

Specifications and dimensions subject to change without notice. Specification sheets that appear on pinnacle-ltg.com are the most recent version and supersede all other previously printed or electronic versions.



**Direct Source: BIOS<sup>1</sup>**

- CRI >84, R9 >90
- Spectrum focused lighting for circadian stimulus
- High EML or M/P ratio: .8 for 3500K, .9 for 4000K
- COI: ≤3.3
- Available for use with most Driver or Control options

**Custom Output - Lumens OR Wattage**

<b>CLB</b> _____	Specify CRI, CCT and desired lumens (i.e. CL835500)	Specify lumens between standard offering listed below. Lumens are specified per color temp
<b>CWB</b> _____	Specify CRI, CCT and desired wattage (i.e. CW9407)	Specify watts between standard offering listed below

**BIOS**

	Color	Lumens per foot	Shielding <sup>1</sup>					
			A Satine		HE High Efficiency		BW Batwing	
			LPW	Watts/ft	LPW	Watts/ft	LPW	Watts/ft
<b>B35</b>	3500K	500	61	8.2	74	6.8	72	6.9
<b>B35HO</b>	3500K	750	61	12.4	74	10.2	71	10.5
<b>B40</b>	4000K	500	63	7.9	76	6.6	73	6.8
<b>B40HO</b>	4000K	750	62	12.2	76	9.9	73	10.2

<sup>1</sup>LPW and watts/ft based off 48" fixture size.

**Direct Source: Blanco<sup>1</sup>**

- CRI >90, R9 >92
- 3 Channel tunable white for precise black body curve CCT
- Allows for high color consistency between fixtures
- Self-commissioning with Wattstopper DLM integrated controls
- Requires Control Ordering Code **B3LM** (pg. 6)
- Requires Drive Ordering Code **EC2** (pg. 4)

**Blanco 3 Tunable White (TW3)**

	Range	Shielding <sup>1</sup>								
		A Satine			HE High Efficiency			BW Batwing		
		Lumens/ft	LPW	Watts/ft	Lumens/ft	LPW	Watts/ft	Lumens/ft	LPW	Watts/ft
<b>TW3</b>	2700-6500K	627	74	8.5	747	88	8.5	731	87	8.5

**Indirect Source: White LED<sup>1</sup>**

**Custom Output - Lumens OR Wattage**

<b>CL</b> _____	Specify CRI, CCT and desired lumens (i.e. CL835500)	Specify lumens between standard offering listed below. Lumens are specified per color temp
<b>CW</b> _____	Specify CRI, CCT and desired wattage (i.e. CW9407)	Specify watts between standard offering listed below

**80 CRI**

	Color	Lumens per foot	Shielding <sup>1</sup>							
			HE High Efficiency		BW Batwing		WHE Asymmetric		HEA Ascent	
			LPW	Watts/ft	LPW	Watts/ft	LPW	Watts/ft	LPW	Watts/ft
<b>830</b>	3000K	500	140	3.6	131	3.8	119	4.2	125	4.0
<b>830HO</b>	3000K	750	146	5.1	135	5.5	119	6.3	125	6.0
<b>830VHO</b>	3000K	1000	147	6.8	137	7.3	122	8.2	128	7.8
<b>835</b>	3500K	500	145	3.4	135	3.7	123	4.1	125	4.0
<b>835HO</b>	3500K	750	151	5.0	141	5.3	122	6.1	129	5.8
<b>835VHO</b>	3500K	1000	148	6.8	141	7.1	126	8.0	133	7.5
<b>840</b>	4000K	500	145	3.4	135	3.7	123	4.1	125	4.0
<b>840HO</b>	4000K	750	151	5.0	141	5.3	122	6.1	129	5.8
<b>840VHO</b>	4000K	1000	148	6.8	141	7.1	126	8.0	133	7.5

**90 CRI**

<b>927</b>	2700K	500	118	4.2	110	4.5	99	5.1	102	4.9
<b>927HO</b>	2700K	750	118	6.4	110	6.8	98	7.6	104	7.2
<b>927VHO</b>	2700K	1000	121	8.3	113	8.9	100	10.0	105	9.5
<b>930</b>	3000K	500	124	4.0	120	4.2	105	4.7	111	4.5
<b>930HO</b>	3000K	750	129	5.8	120	6.3	107	7.0	111	6.8
<b>930VHO</b>	3000K	1000	132	7.6	123	8.2	108	9.3	114	8.8
<b>935</b>	3500K	500	124	4.0	120	4.2	105	4.8	111	4.5
<b>935HO</b>	3500K	750	128	5.8	119	6.3	107	7.0	110	6.8
<b>935VHO</b>	3500K	1000	132	7.6	122	8.2	107	9.3	113	8.8
<b>940</b>	4000K	500	124	4.0	120	4.2	105	4.8	111	4.5
<b>940HO</b>	4000K	750	128	5.8	119	6.3	107	7.0	110	6.8
<b>940VHO</b>	4000K	1000	132	7.6	122	8.2	107	9.3	113	8.8

Specifications and dimensions subject to change without notice. Specification sheets that appear on pinnacle-ltg.com are the most recent version and supersede all other previously printed or electronic versions.



Indirect Source: BIOS<sup>1</sup>

Custom Output - Lumens OR Wattage

<b>CLB</b> _____	Specify CRI, CCT and desired lumens (i.e. CL835500)	Specify lumens between standard offering listed below. Lumens are specified per color temp
<b>CWB</b> _____	Specify CRI, CCT and desired wattage (i.e. CW9407)	Specify watts between standard offering listed below

BIOS

	Color	Lumens per foot	Shielding <sup>1</sup>	
			HE High Efficiency LPW	Watts/ft
<b>B35</b>	3500K	500	81	6.1
<b>B35HO</b>	3500K	750	82	9.1
<b>B35VHO</b>	3500K	1000	79	12.6
<b>B40</b>	4000K	500	84	6.0
<b>B40HO</b>	4000K	750	82	9.2
<b>B40VHO</b>	4000K	1000	82	12.2

<sup>1</sup>LPW and watts/ft based off 48" fixture size.

Indirect Source: Blanco<sup>1</sup>

Blanco 3 Tunable White (TW3)

	Range	Shielding <sup>1</sup>		
		HE High Efficiency Lumens/ft	LPW	Watts/ft
<b>TW3</b>	2700-6500K	835	99	8.5

<sup>1</sup>LPW and watts/ft based off 48" fixture size.

Source: MOD Options

- Specify **MOD** in the part number for any of the below options
- All RGB\_Source Options will require specific driver and control
- Consult factory for **MOD** specification details, pricing, and lead-time information

MOD	Required Driver		Required Control	
	Color Changing RGB LED	EC1/EC4	DMX	
Color Changing RGB-W LED	EC1/EC4	DMX		
2 Channel Tunable White				

Length

- For Continuous Runs, add 3/16" (4.7mm) for each end plate or 3/8" (9.5mm) to the overall length of the row
- BIOS and Blanco3 are only available in foot lengths

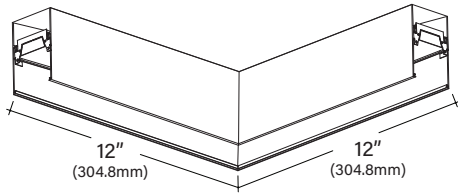
2	3	4	5	6	7	8	-
Indiv. Fixture	Indiv. Fixture	Indiv. Fixture	Indiv. Fixture	Indiv. Fixture	Indiv. Fixture	Indiv. Fixture	Cont. Run
24-3/8" (619.1mm)	36-3/8" (934.8mm)	48-3/8" (1228.7mm)	60-3/8" (1533.5mm)	72-3/8" (1838.3mm)	84-3/8" (2143.1mm)	96-3/8" (2447.9mm)	Specify nominal overall row length to the 1/8" Longer lead-time may apply for lengths to the 1/8". Consult factory.

Specify to the 1/8"

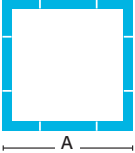
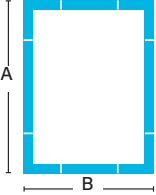
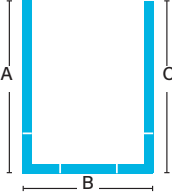
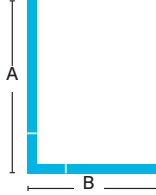
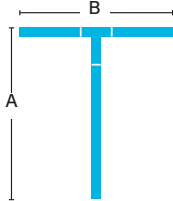
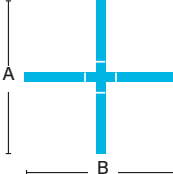
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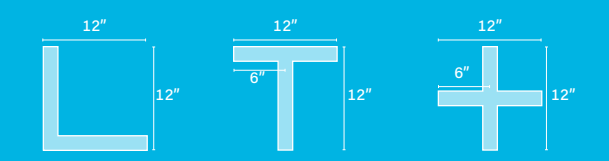
## Pattern



- Specify pattern shape and overall dimensions (includes corner dimensions)
- Refer to dimensions table below for available standard lengths
- All connectors are direct only
- 90 degree horizontal corners are 12"x12" (overall, outside dimension)
- Angles and shapes not shown require Mod Pattern; consult factory
- Only available with "A" or "HE" lens options

<b>S</b>	<b>R_x</b>	<b>U_x_x</b>	<b>L_x</b>	<b>T_x</b>	<b>X_x</b>
Square Provide A Example: <b>S4'</b> Minimum Length- 4'x4'	Rectangle Provide AxB Example: <b>R4'x4'</b> Minimum Length- 4'x4'	U-Shape Provide AxBxC Example: <b>U3'x4'x3'</b> Minimum Length- 3'x4'x3'	L-Shape Provide AxB Example: <b>L3'x3'</b> Minimum Length- 3'x3'	T-Shape Provide AxB Example: <b>T3'x5'</b> Minimum Length- 3'x5'	X-Shape Provide AxB Example: <b>X5'x5'</b> Minimum Length- 5'x5'
					

Horizontal Details: Every Connection is 12" x 12" in Overall Dimension



## Length or Pattern: MOD Options

- Specify **MOD** in the part number for any of the below options
- Consult factory for **MOD** specification details, pricing, and lead-time information

<b>MOD</b>	Specify MOD for patterns, lengths or angles not shown above
	45- 180 degree angles
	Single-piece welded housings up to 4' x 4



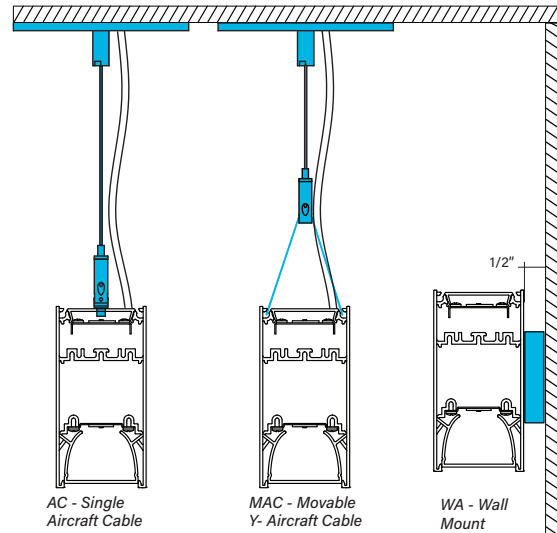


## Mounting

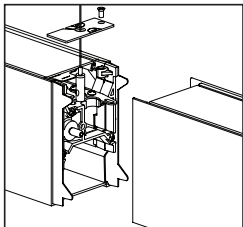
- Specify cable length in ordering code (AC48G1)
- Standard specifiable lengths are 48", 120", 240" and 350"
- End plates and power cord attached at factory
- Aircraft cable (AC) mounts on 4' (1219.2mm) and 8' (2438.4mm) centers
- Maximum recommended movable mounting locations are 12" from end of 4' fixture and 18" from end of 8' fixture
- Aircraft Cable supplied with 5" (127mm) power and 2" (50.8mm) non-power canopies
- Canopies and pendants match fixture finish, power cords are white, grey, or black depending on fixture finish. See Finish section for additional details.

- Approved for dry/damp location unless otherwise noted
- Refer to installation instructions during installation at the job site
- Maximum fixture weight is 25 lbs for a standard 4' fixture
- AC\_GS and MAC\_GS – works with screw slot and bolt slot grid ceiling types
- Wall Mount – ADA Compliant, bracket is 1/2" off wall
- MAC options not available with HEA lens option
- For a wall mounted fixture with an indirect asymmetric lens, light will be directed away from the wall as a standard

<b>AC_G1</b>	Aircraft Cable 1" (15/16") T-Bar
<b>AC_G9</b>	Aircraft Cable 9/16" T-Bar
<b>AC_GS</b>	Aircraft Cable Screw Slot T-Bar
<b>AC_JB</b>	Aircraft Cable Junction Box
<b>AC_ST</b>	Aircraft Cable Structure
<b>AC5_G</b>	Aircraft Cable 5" (127mm) Non-Power Canopy
<b>AC5_JB</b>	Aircraft Cable 5" (127mm) Non-Power Canopy
<b>SQ_G</b>	Aircraft Cable 5" (127mm) Square Canopy
<b>SQ_JB</b>	Aircraft Cable 5" (127mm) Square Canopy
<b>MAC_G1</b>	Moveable AC 1" (15/16") T-Bar
<b>MAC_G9</b>	Moveable AC 9/16" T-Bar
<b>MAC_GS</b>	Moveable AC Screw Slot T-Bar
<b>MAC_JB</b>	Moveable AC Junction Box
<b>MAC_ST</b>	Moveable AC Structure
<b>MAC5_G</b>	Moveable AC 5" (127mm) Non-Power Canopy
<b>MAC5_JB</b>	Moveable AC 5" (127mm) Non-Power Canopy
<b>MSQ_G</b>	Moveable AC 5" (127mm) Square Canopy
<b>MSQ_JB</b>	Moveable AC 5" (127mm) Square Canopy
<b>WA</b>	Wall Mount



## Straight EDGE Joint System



- The Straight EDGE Joint comes standard for all runs.
- Two connection points – one to cinch fixtures together, the other to perfectly align all fixtures in a run.
- Factory-installed light shields on both sides of the fixture ensure no light leaks.
- Patented.

## Mounting: MOD Options

- Specify **MOD** in the part number for any of the below options
- Consult factory for **MOD** specification details, pricing, and lead-time information

**MOD** Pendant Pipe

## Voltage

- Some EX2DI configurations will not accommodate all voltage options; consult with factory

<b>U</b>	Universal
<b>1</b>	120 volt
<b>2</b>	277 volt
<b>3</b>	347 volt



## Driver

- Standard Driver Option = PL2
- Driver Lifetime: 50,000 hours at 25°C ambient operating conditions
- For more driver options see Pinnacle Resource Guide
- Some EX2DI configurations will not accommodate all driver options; consult with factory

0-10V Drivers	
<b>FSD</b>	Factory Select Driver 1%, 0-10v
<b>PL2</b>	Signify Advance Xitanium 1%, 0-10v
<b>PL4</b>	Advance Xitanium 347v 1%, 0-10v, requires 347v
<b>OL2</b>	Osram Optotronic, 1%, 0-10v
<b>OL4</b>	Osram Optotronic 347v, 1% 0-10v, requires 347v option
<b>EE1</b>	eldoLED ECOdrive 1%, 0-10v Logarithmic
<b>EE2</b>	eldoLED ECOdrive 1%, 0-10v Linear
<b>ES1</b>	eldoLED SOLOdrive 0-10v, 0% Logarithmic
<b>ES2</b>	eldoLED SOLOdrive 0-10v, 0% Linear
<b>OL5</b>	Osram Optotronic 1%, 0-10v, AUX
DALI Drivers	
<b>EE3</b>	eldoLED SOLOdrive .1%, DALI (logarithmic)
<b>EE4</b>	eldoLED SOLOdrive .1%, DALI (linear)
<b>OD1</b>	Osram Optotronic 1%, DEXAL
<b>OD2</b>	Osram Optotronic 1%, DALI 2 Channel
Lutron Drivers	
<b>LH1</b>	Lutron Hi-lume Soft-on, Fade-to-black 1%, EcoSystem, LDE1
<b>LH4</b>	Lutron Hi-Lume 1%, 2-wire, Lutron-LTEA2W, 120v only
Alternate Drivers	
<b>PS1</b>	Signify Advance Xitanium Step Dimming 50%/100%
<b>PR1</b>	Philips Advance Xitanium SR, requires EASYS, VDO or VRF
<b>OD1</b>	Osram Optotronic 1%, DEXAL
<b>EH1</b>	ELV 120v only, 0-10v universal
<b>EC2</b>	Constant Voltage LED driver, 120v or 277v required

## Drivers: MOD Options

- Specify **MOD** in the part number for any of the below options
- Consult factory for **MOD** specification details, pricing, and lead-time information

**MOD** Power Over Ethernet

## How to Specify Circuiting, Battery and Emergency

- Select fixture circuiting from options below
  - Some EX2DI configurations will not accommodate all circuiting options, consult with factory

### Circuiting

<b>1</b>	Single Circuit
<b>2</b>	Dual Circuit
<b>M</b>	Multi Circuit
<b>E</b>	Emergency Circuit only
<b>N</b>	Night Light Circuit only

- Battery and emergency section options are available in addition to fixture circuit
  - Select battery and emergency section options below; factory shop drawing required
  - Some EX2DI configurations will not accommodate all circuiting options, consult with factory



## Battery and/or Emergency If Required

**0** No battery or specific emergency section required

### Battery

- Select battery section type if required, indicate total QTY. *Example 2PL*
- 90 minute battery runtime; test button location dependant on configuration, consult factory
- No battery option available for 2' or 3' lengths
- Entire direct fixture housing is on battery for lengths up to 5'
- Half of direct fixture is on battery for 6' or 8' housing lengths
- For more battery options available, see Pinnacle Resource Guide

#### For Approximate Battery Lumen Output

- Multiply battery wattage X fixture LPW shown on Lumen Table
- 92.3 (LPW) x 10 (watts) = 923 battery lumen output

<b>0</b>	No Battery
<b>_ILL</b>	Iota 10w Integral Lithium, Self Testing
<b>_IRH</b>	Iota 20w Remote
<b>_PLL</b>	Bodine 10w Integral Lithium, Self Testing
<b>_PRH</b>	Bodine 20w Remote

### Emergency

- Select emergency section type if required, indicate total QTY. *Example 1E*
- Combine battery and emergency section ordering codes if both options are selected

<b>_FSG</b>	Factory Select ALCR, Automatic Load Control Relay
<b>_GI</b>	Iota ETS DR, Emergency Lighting Control Device
<b>_GB</b>	Bodine GTD, Emergency Lighting Control Device
<b>_E</b>	Emergency circuit section
<b>_N</b>	Night Light circuit section
<b>_L</b>	Life Safety circuit section NO THROUGH WIRE

#### Battery OR Emergency Ordering Examples

- Single circuit, 10w Integral Battery      Ordering Code: 1-1PL
- Emergency only, 10w Integral Battery      Ordering Code: E-1PL
- Single circuit, GTD required      Ordering Code: 1-1G

#### Combination Section Ordering Examples

- Single circuit, (1) 10w battery, (1) emergency section      Ordering Code: 1-1PL1E
- Multi circuit, (2) 10w battery, (2) emergency sections      Ordering Code: M-2PL2E
- Single circuit, (1) night light section      Ordering Code: 1-1N

## Finish

- Standard powder-coat textured white, metallic silver, textured black, graphite or bronze painted finish; consult factory for chip of standard paint finishes
- Selecting a fixture finish other than white may impact lumen output; consult factory for more information

<b>W</b>	White <i>(white cord/white canopy)</i>
<b>S</b>	Metallic Silver <i>(grey cord/silver canopy)</i>
<b>BL</b>	Textured Black <i>(black cord/black canopy)</i>
<b>BR</b>	Bronze <i>(white cord/bronze canopy)</i>
<b>GR</b>	Graphite <i>(white cord/graphite canopy)</i>
<b>CC</b>	Custom Color <i>(white cord/color match canopy)</i>

## Fixture Options

- Additional options to enhance the fixture and finish of the product
- Specify CC-C to match housing. If not specified, canopy will be standard matte white

<b>QS</b>	Quick Ship
<b>DSP</b>	Customer Supplied Battery/Driver/Sensor

### Quick Ship

Shielding	CRI, CCT & Output	Mounting	Voltage	Driver	Circuiting	Battery	Finish	
<b>10-Day</b>								
<b>A</b> - Direct <b>HE</b> - Direct <b>BW</b> - Direct <b>WHE</b> - Direct <b>HE</b> - Indirect <b>BW</b> - Indirect <b>WHE</b> - Indirect	80 CRI, all color temperatures, all lumen packages <i>See pg 2</i>	<b>(M)AC48G</b> <b>(M)AC48JB</b> <b>(M)AC48ST</b>  <b>W</b>	(M)AC to Grid (M)AC to J-BOX (M)AC to Structure Wall Mount	<b>U</b> <b>1</b> <b>2</b> Universal (120-277) 120V 277V	<b>FSD</b> <b>PL2</b> <b>OL2</b> Factory Select Driver <i>(1%, 0-10v)</i> Advance Xitanium 0-10v, 1% Osram 0-10v, 1%	<b>1</b> <b>E</b> <b>N</b> Single Circuit Emergency Night Light	<b>0</b> <b>_ILL</b> None Iota 10w Integral	<b>W</b> <b>S</b> <b>BL</b> White Silver Black

All lengths and continuous rows up to 1,000 ft OR 150 individual fixtures. Black QuickShip only available in 4', 6', and 8' individual lengths. Consult factory for larger projects.

## Fixture Options: MOD Options

- Specify **MOD** in the part number for any of the below options
- Consult factory for **MOD** specification details, pricing, and lead-time information

<b>MOD</b>	Remote Driver End Power Feed
------------	---------------------------------



## Controls

- Pinnacle Lighting offers easy to specify network control solutions that connect to an intelligent centralized system to maximize lighting energy efficiencies or integral sensors for individual fixture control
- Pinnacle Lighting fixtures ship technology ready; commissioning by others
- Controls can only be used with Single Circuit (1) or Emergency Circuit (E)
- Contact factory for any non-standard configurations for layout, placement, or EM options
- One drop per sensor typical, consult factory for more information

	Solution	Components	Network/Sensor	Connection	Required Drivers	Limitation
<b>DLMFC</b>	Legrand Wattstopper DLM	LMFC-011	Digital Lighting Management (DLM)	Wired, one RJ45 ports	OL2, OL4	Not available with Battery
<b>DLMFS</b>	Legrand Wattstopper LLLC	LMFS-601-W / LMF1-111	Wireless DLM Fixture Sensor	Wireless	OD1, PR1, 0-10v	0-10v requires interface
<b>EASYS</b>	Philips EasySense	SNS-210	Daylight/PIR Occupancy	Wireless to switches	PR1	Not available with 347 volt
<b>SNSLM</b>	Encelium Sensilum	EN-CLM-PIR-DD-ZB	Encelium, Daylight/PIR Occupancy	Wireless	OD1, OL5	Not available with 347 volt
<b>WLWX</b>	Eaton Wavelinx	SWPD1, NSP3IVMVDC1	WaveLinx WCL, Daylight	Wireless	Any 0-10v	Not available with 347 volt
<b>VDO</b>	Lutron Vive Sensor	DFCSJ-OEM-OCC	Vive, Daylight/PIR Occupancy	Wireless	OD1, PR1	Not available with 347 volt
<b>VRF</b>	Lutron Vive Connected	DFCSJ-OEM-RF	Vive	Wireless	OD1, PR1	Not available with 347 volt
<b>ENLI</b>	Enlighted	SU-5E-IOT, CU-4E	Enlighted, Daylight/PIR Occupancy	Wireless	Any 0-10v	Not available with 347 volt
<b>ENLC</b>	Enlighted	SU-5E-CL, CU-4E	Enlighted, Daylight/PIR Occupancy	Wireless	Any 0-10v	Not available with 347 volt

## Controls: Tunable White

- Pinnacle Lighting offers easy to specify tunable white solutions for integrated building control solutions or standalone controls
- Pinnacle Lighting fixtures ship technology ready; commissioning by others
- Controls can only be used with Single Circuit (1) or Emergency Circuit (E)
- Contact factory for any non-standard configurations for layout or placement

	Solution	Components	Network/Sensor	Connection	Required Drivers	Required LED	Required Controls	Limitations
<b>B3LM</b>	Legrand Wattstopper Blanco 3	BLM3-DLM	Digital Lighting Management (DLM)	Wired, two RJ45 ports	EC2	TW3	B3LM	Not available with 347 volt

## Controls: MOD Options

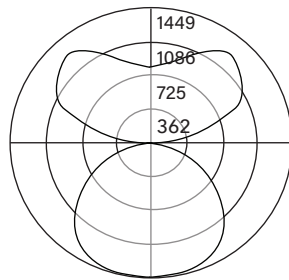
- Specify **MOD** in the part number for any of the below options
- Control** Options may require specific driver. Refer to the chart below
- Consult factory for **MOD** specification details, pricing, and lead-time information

	Required Driver
<b>MOD</b> Enlighted (Wireless) - ENLI	Any 0-10v
Enlighted (Wireless) - ENLC	Any 0-10v
Encelium Sensilum	OD1, OL5
Acuity nLight Air Wireless Connected	EE6, ES6

## Photometrics

### Satine Lens - Open

Test # Scaled from ITL93235 & ITL94661  
 Catalog # EX2DI-BW-BW-840HO-840VHO-4  
 Lumens 8000 lm  
 Watts 60.1 W  
 Efficacy 133 LPW



### Candela Distribution

Vert Angle	Horizontal Angle				
	0	22.5	45	67.5	90
0	1448	1448	1448	1448	1448
5	1441	1442	1445	1448	1449
10	1420	1422	1434	1444	1446
15	1385	1386	1413	1433	1437
25	1268	1274	1326	1360	1370
35	1100	1111	1172	1205	1211
45	890	905	958	982	987
55	663	678	717	732	728
65	435	445	471	470	466
75	219	225	237	228	224
85	47	53	55	49	46
90	7	52	92	86	93
95	73	144	225	208	195
105	221	300	495	562	539
115	369	438	649	873	925
125	486	570	785	1011	1089
135	572	666	906	1111	1185
145	655	725	934	1131	1207
155	729	768	892	1005	1052
165	784	799	848	892	909
175	811	814	819	823	826
180	814	814	814	814	814

### Luminance Data (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	22880	22482	22417
55	20964	19957	19378
65	18597	16732	15551
75	15161	12143	10442
85	9288	5344	3744

For all available IES files, please visit our website at [pinnacle-ltg.com](http://pinnacle-ltg.com). Photometry testing in accordance to IESNA-LM-79-08 at an NVLAP accredited testing laboratory. Testing conducted at 25°C ambient conditions.

Specifications and dimensions subject to change without notice. Specification sheets that appear on [pinnacle-ltg.com](http://pinnacle-ltg.com) are the most recent version and supersede all other previously printed or electronic versions.

Designed in Denver, CO • USA | [pinnacle-ltg.com](http://pinnacle-ltg.com) | O: 303-322-5570 F: 303-322-5568

EX2DI\_LED\_SPEC\_JULY2022



## Applications & Certificates

**Construction:** 6063-T6 Extruded aluminum housing. Highly reflective steel white painted reflector.

**Shielding:** Diffuse snap-in acrylic lens, removable for maintenance.

**Mounting:** Aircraft cable and wall mount available. Select from 2 aircraft cable options. Select the straight aircraft cable that mounts on 4'-0" (1219.2mm) and 8'-0" (2438.4mm) centers or the moveable adjustable Y-cable mount. The Y-Cable design allows for adjustable mounting locations. Aircraft Cable supplied with 5" (127mm) power and 2" (50.8mm) non-power canopies. Refer to installation instructions for appropriate ceiling detail. Canopies are painted white unless otherwise specified. Maximum fixture weight is 20 lbs. for a standard 4' fixture.

**White LED:** 25°C test environment. Lumen output/wattage has a margin of +/- 5%; 2' or 3' lengths may have a greater wattage deviation. All luminaire configurations tested in accordance with IES LM-79. Diodes tested in accordance with IES LM-80. Lifetime calculated using IES TM-21. Minimum lifetime greater than 60,000 hours. Lifetime Projection L70 = 146,500 hours and L90 = 45,000 hours. MacAdam 3-Step Ellipses. Not all products are Lighting Facts listed. For all available IES files, please visit our website at pinnacle-ltg.com. Three lumen packages available. Standard, High (HO) and Very High (VHO). Custom outputs are available. Specify custom lumens or watts between standard offering listed on CRI, CCT & Output page. 80 CRI is available for 3000K, 3500K, and 4000K. 90 CRI is available for 2700K, 3000K, 3500K, and 4000K. 80 CRI = R9≥19 and 90 CRI = R9≥61.

**BIOS LED:** Spectrum focused lighting for circadian stimulus. EML or M/P ratio: .8 for 3500K, .9 for 4000K COI >3.0. Not all lumen packages available. Two lumen packages available for direct. Standard, and High (HO). Three lumen packages available for indirect. Standard, High (HO) and Very High (VHO). Custom outputs are available. Specify custom lumens or watts between standard offering listed on CRI, CCT & Output page.

**Tunable White LED:** Blanco 3; 3 Channel tunable white for precise black body curve CCT. Self-commissioning with Wattstopper DLM integrated controls. Custom lumen output and color temperature configurations require use of controls.

**Voltage:** Universal (U), 120 volt (1), 277 volt (2) and 347 volt (3) options available. Must specify OL4 in Driver section when 347 volt (3) is selected. Some EDGE configurations will not accommodate all voltage options; consult with factory.

**Driver:** Standard Driver Option is Advance Xitanium 0-10V, 1% = PL2. Electronic driver, Power factor is >0.9 with a THD <20%. Driver Lifetime: 50,000 hours at 25°C ambient operating conditions. Ambient operating range: -20°F/-30°C to 94.3°F/34.6°C. For more driver options, see Pinnacle Resource Guide. Some EDGE configurations will not accommodate all driver options.

**Circuiting:** Select from single circuit (1), Multi circuit - For multiple circuiting and zone control, requires factory shop drawing (M), Emergency circuit (E), Life Safety (L) or Night Light circuit (N). For emergency circuiting situations that require no through wire or circuit separation, Life Safety Circuit should be selected. This will provide a separate power feed and only the Life Safety Circuit in that section. Some EDGE configurations will not accommodate all circuiting options; consult with factory.

**Battery & Emergency:** Select battery or emergency options if required. If battery or emergency option is not required, enter 0. Battery duration is 90 minutes as standard. Test button location dependant on configuration, consult factory. For more Battery options, see Pinnacle Resource Guide.

**Finish:** Standard powder-coat textured white, metallic silver, textured black, graphite or bronze painted finish; consult factory for chip of standard paint finishes or for additional custom color and finish options.

**Controls:** DLM utilizes wired network connections for digital control through switching and dimming. nLight Air rES7 sensor provides wireless control, daylight harvesting and occupancy detection with PIR using eldoLED LED drivers. nLight Air rES7 sensor provides wireless control, daylight harvesting and occupancy detection with PDT using eldoLED LED drivers. nLight Air rIO module provides wireless control using eldoLED LED drivers. EasySense sensor provides daylight harvesting and PIR occupancy detection using the SR LED driver; the Philips app provides advanced configurations. ENCELIUM SensiLUM sensor provides wireless control, daylight harvesting and PIR occupancy; driver data is available when using the DEXAL driver. ENCELIUM SensiLUM sensor provides wireless control, daylight harvesting and PIR occupancy; driver data is available when using the DEXAL driver. Wavelinx Connected Lighting sensor provides wireless control and daylight harvesting using 0-10V LED drivers. Lutron Vive sensor provides wireless control, daylight harvesting and PIR occupancy detection using DEXAL or SR LED drivers. Lutron Vive module provides wireless control using DEXAL or SR LED drivers. Enlighted Smart Sensor provides multi-functionality including daylight harvesting and PIR occupancy; for IOT platform using 0-10v LED drivers. Enlighted Smart Sensor provides multi-functionality including daylight harvesting and PIR occupancy; for Connected platform using 0-10v LED drivers.

**Labels:** ETL listed conforming to UL 1598 and CSA 250. Standard, HO and VHO lumen packages are IC Rated, approved for dry/damp location unless otherwise noted.

**Fixture Weight:** Maximum fixture weight is 25lbs per 4' fixture.

### Buy American Act Compliant

**Warranty:** EDGE LED offered with a 5-year limited warranty. Covers LED, driver and fixture.



# Gaze | Pendant & Surface Square

SA / SAA

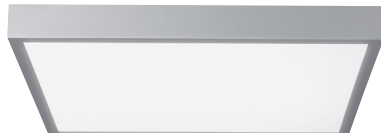


PRUDENTIAL LTG.

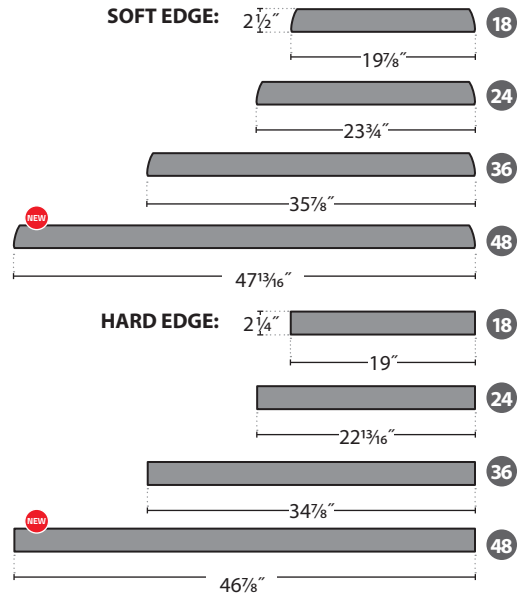
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24" Soft Edge



24" Hard Edge



## Introducing Gaze, an exercise in reductionism.

Gaze promises smooth, even diffusion of light, and is available in a clean Hard Edge or a distinctively curved Soft Edge with an elegant regress and is undeniably refined. Power over Aircraft Cable (PAC) eliminates power cord clutter. Mix with Gaze acoustics for improved sound absorption.

**NOTE:** Combine D1 and D9 IES files for D9 Semi-Direct

Lumen output may vary +/- 5%  
3500K used for lm/ft estimates above  
4000K +2% llf, 3000K -2%, 2700K -4%  
-10% LLF for 90 CRI (4K, 3500K and 3K)

See LED Details PDF for more info

Declare.



Made in the USA

## LUMEN OUTPUT:

	D1 DIRECT	LO	MO	SO	HO
18:	lm	1550	2900	4225	5550
	w	13	24	35	48
24:	lm	2200	4050	5875	7675
	w	19	35	52	69
36:	lm	5000	9050	13100	16725
	w	43	81	121	165
48:	lm	6200	10500	17000	20700
	w	58	99	168	218
	D9 INDIRECT	LO	MO	SO	HO
18 & 24:	lm	550	1425	2200	2825
	w	7.5	18	30	41
36 & 48:	lm	1200	2400	4800	6650
	w	16	34	69	99



SERIES	SIZE	LED COLOR	OUTPUT	FIXTURE COLOR	DISTRIBUTION	CIRCUITING	VOLTAGE	MOUNTING	CEILING SYSTEMS	DRIVERS	OPTIONS
GazeSQS Square Soft Edge	18 24	LED27 2700K (90CRI)	LO Low	TMW Textured Matte White (Standard)	D1 Direct	SC Single Circuit	UNV (120-277)	CA48", 96" or 144" Aircraft Cable (Adjustable)	X1 T-Bar (PAC - NA)	ND Non-Dimming	EMHE CAT20 Emergency Battery (800 delivered lumens) 18: Remote Only
GazeSQH Square Hard Edge	36 <b>NEW</b> 48	LED3 3000K LED35 3500K LED4 4000K LED3-90 90CRI LED35-90 90CRI LED4-90 90CRI LED5-90 90CRI	MO Medium SO Standard HO High (Static White Only) PROG Programmable Light Output (Specify desired lm or w/ fixture) <b>NOTE:</b> Specify separate output Down/Up if desired eg. LO/ HO (Low Down, High Up)	YGW Gloss White Y Premium Color CC Custom Color <b>NOTE:</b> All canopies are painted the same color as the fixture. Consult factory to specify different canopy color (eg. White)	D9 Semi-Direct	DC Dual Circuit	347	RPM 48", 96" or 144" Round Cast Aluminum Canopy SPM 48", 96" or 144" Square Cast Aluminum Canopy SURF Surface Flush (D1 only) SURS Surface Stand-off PAC-R/S 96" Powered Aircraft Cable Round/Square Canopy, Direct canopy mount, X3 only (See page 8) NA with some configurations RPAC-R/S Remote Powered Aircraft Cable Round/Square Canopy (See page 8) NA with some configurations or 2 Remote Boxes may be needed	X3 Hard Ceiling	DM01 0-10v, 1% Dimming (Standard) LDE1* Lutron Hi-lume 1% EcoSystem LED (Soft fade on, fade-to-black dimming) ECO* 1% 0-10v, EldoLED (Logarithmic dimming std) ECDA* 1% DALI, EldoLED (Logarithmic dimming std) SOLO* 0.1% 0-10v, EldoLED (Dim-to-dark, Logarithmic dimming std) SODA* 0.1% DALI, EldoLED (Dim-to-dark, Logarithmic dimming std) *HO NA	RPAC-EMHE often requires TWO Remote boxes, consult factory (See page 8) EMHE-TL Integral EMHE with Test Light (except SURF) EMHE-RTK Remote EMHE with Remote Test Kit ETS-DR Iota ETS-DR Emergency Transfer Switch <b>SENSORS:</b> FM-105 Wattstopper H164 Hidden Frequency Occupancy Sensor



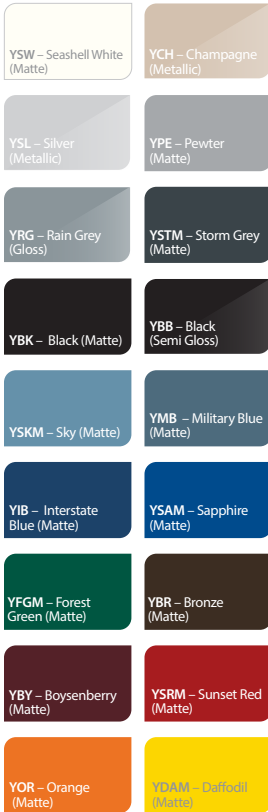


# Gaze | Pendant & Surface Square



PRUDENTIAL LTG.

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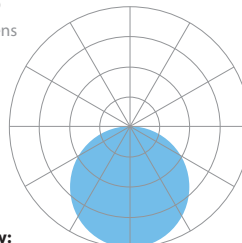
Choose from one of our Premium Colors with no set-up fee.

For paint chip samples, please email: [info@prulite.com](mailto:info@prulite.com)

## D1 — DIRECT

### GAZESQ-24-LED35-MO

4058 Delivered Lumens  
35 Watts  
118 lm/w



**Zonal Lumen Summary:**  
0-90 (Down) = 100%

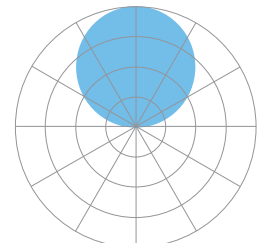
1430

Vertical Angle	0°	25°	45°	65°	90°
0°	1430	1430	1430	1430	1430
5°	1423	1423	1422	1423	1422
15°	1372	1372	1371	1372	1371
25°	1271	1272	1271	1271	1270
35°	1126	1127	1126	1126	1125
45°	947	947	946	946	946
55°	736	736	735	735	736
65°	389	389	390	389	389
75°	206	206	206	206	206
85°	51	51	52	52	52
90°	0	0	0	0	0

## D9 — INDIRECT

### GAZESQ-24-LED35-SO-D9

2200 Delivered Lumens  
30 Watts  
75 lm/w



**Zonal Lumen Summary:**  
0-90 (Down) = 67%  
90-180 (Up) = 33%

865

Vertical Angle	0°	25°	45°	65°	90°
90°	0	0	0	0	0
95°	25	24	23	21	21
115°	230	229	235	246	248
125°	375	377	379	392	396
135°	519	524	524	529	535
145°	653	655	656	654	656
155°	757	759	760	757	756
165°	825	829	830	828	827
175°	860	862	862	861	861
180°	865	865	865	865	865

## LUMEN MAINTENANCE

- L70** — 200,000+ Hours
- L90** — 100,000+ Hours (LO, MO & SO)
- L90** — 60,000+ Hours (HO)

**LED SYSTEM** Drivers are field replaceable.

**PROG** (OPTIONAL) Programmable light output. Specify desired lumens or watts per fixture.

**BINNING** Standard binning (all Prudential LED boards) includes testing at the chip level and board integration to provide consistent color temperature within a 3-step MacAdams ellipse, with +/- 5% lumen output range and +/- .003 Duv.

**LABELS** CSA and ETL damp labeled and I.B.E.W. manufactured.

**ELECTRICAL** Must specify LED dimming controls. LED fixtures have constant current driver(s) with less than 20% THD when loaded to a minimum of 60%. Drivers sink a maximum of 6mA per driver. DM01 LED drivers are 0-10V dimmable and are compatible with most 0-10V wall slide dimmers and direct 0-10V analog signal dimmers. Max driver size 1.65" w x 1.25" h.

## CONSTRUCTION

Housing Extruded aluminum, rolled and welded, >25% PC recycled, 100% recyclable.

Lens Edge Lit Wave Guide with Secondary Acrylic Diffuser.

Weight 18: 21lbs 24: 28lbs 36: 54lbs 48: 100lbs

**MOUNTING** Surface or suspended by aircraft cables or cast aluminum canopy.

**WARRANTY** Single-source, 5 year limited warranty covers standard components and construction.



# Gaze | Pendant & Surface Square

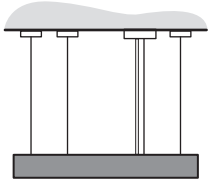


PRUDENTIAL LTG.

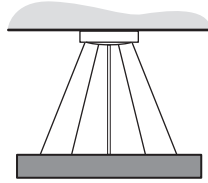
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## MOUNTING OPTIONS

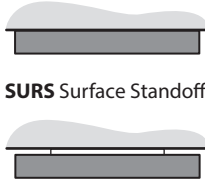
**CA Cable**



**RPM/SPM Canopies**



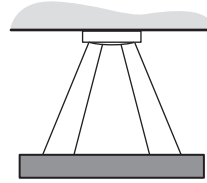
**SURF Surface Flush**



**SURS Surface Standoff**



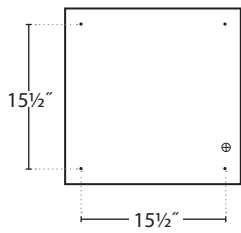
**PAC Powered Aircraft Cable**



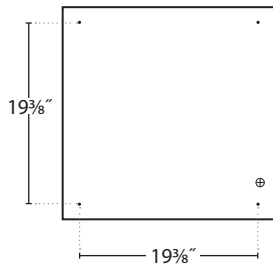
**NOTE:** 18" + 24" = 4 Cables / 36" + 48" = 6 Cables

## CA CABLE MOUNTING DIMENSIONS

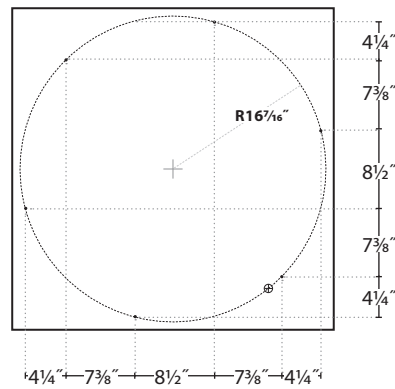
18



24

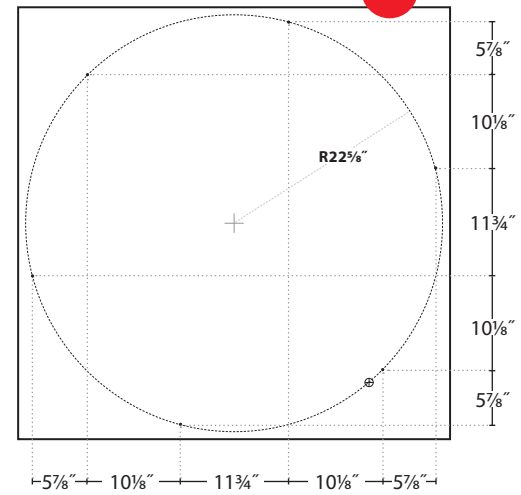


36



48

**NEW**



⊕ 7/8" K.O. for Cord Drop

• Mounting Locations





# Gaze | Pendant & Surface Square

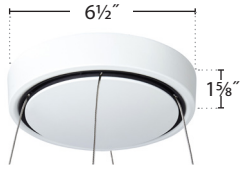


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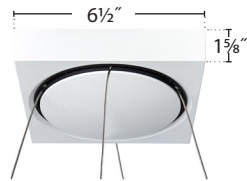
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## CAST ALUMINUM CANOPIES

**RPM48", 96" or 144":**  
Round Cast Aluminum Canopy

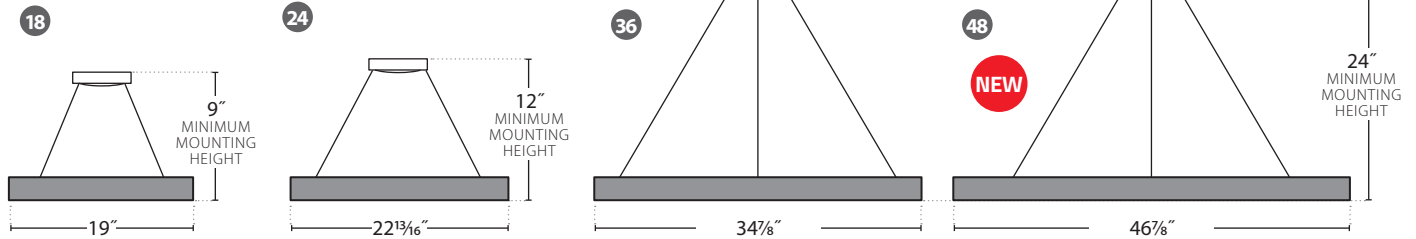


**SPM48", 96" or 144":**  
Square Cast Aluminum Canopy

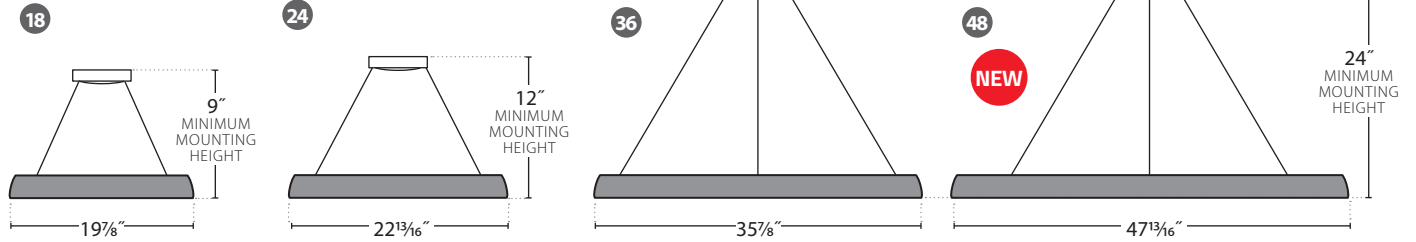


## RPM/SPM CANOPY MINIMUM MOUNTING HEIGHT

### HARD EDGE

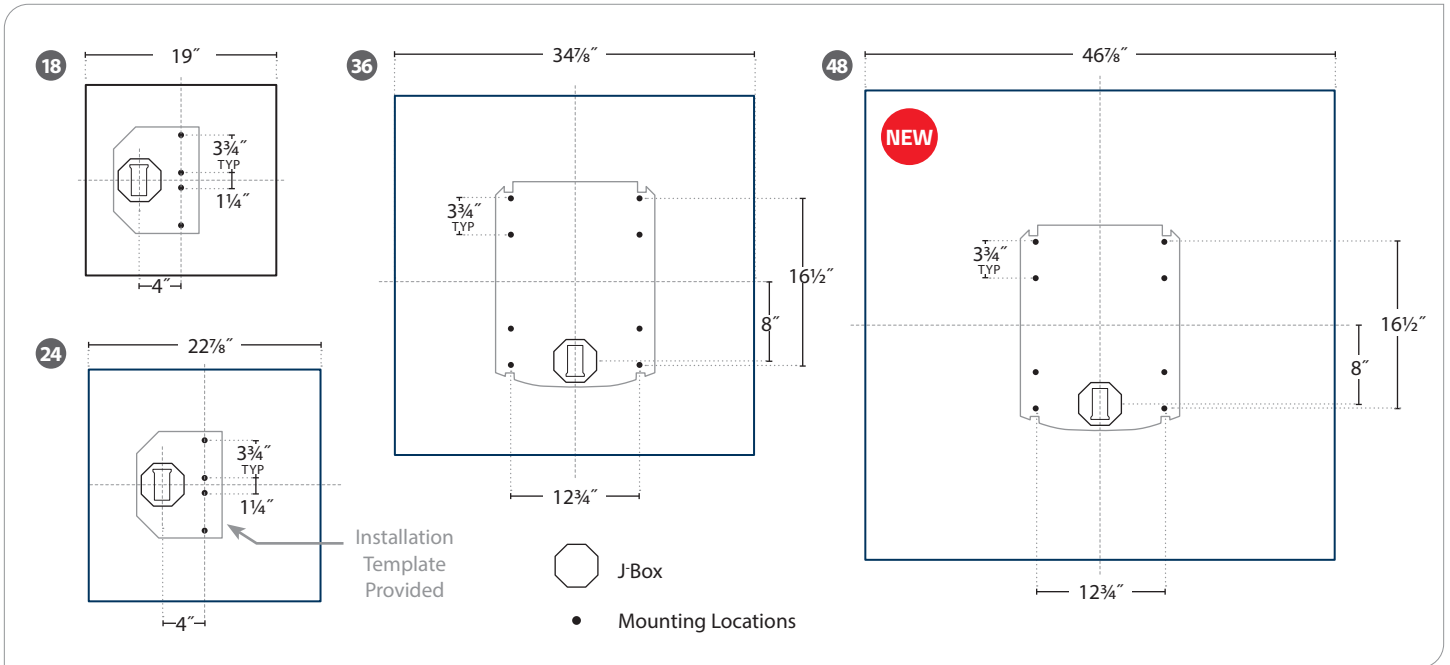


### SOFT EDGE

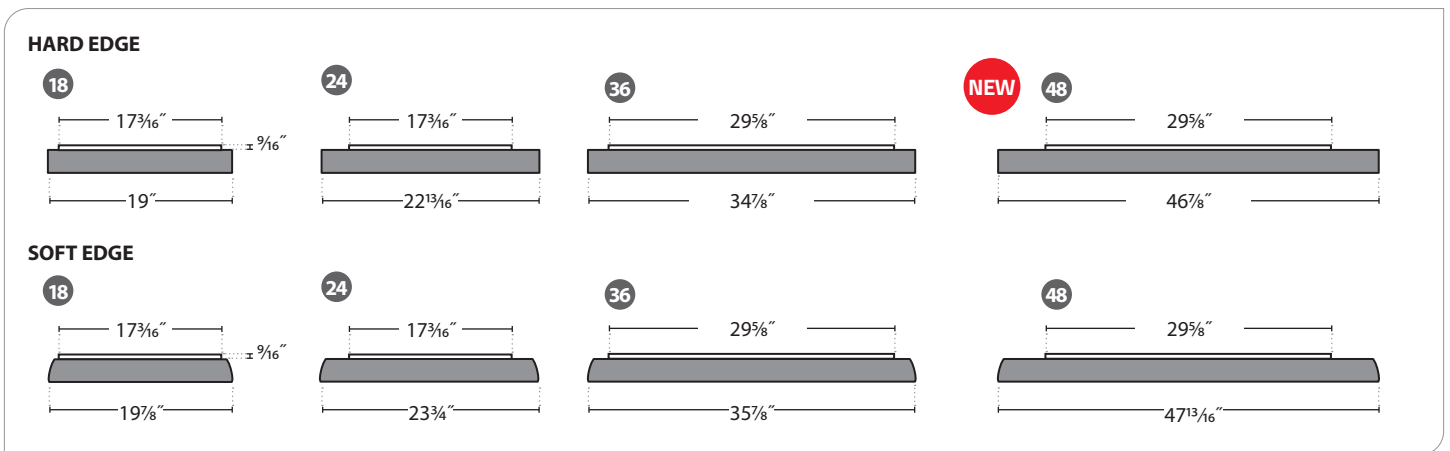




## SURFACE / SURFACE STANDOFF (CEILING OR WALL) MOUNTING DIMENSIONS

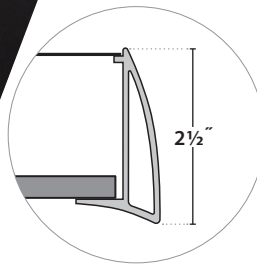


## SURFACE STANDOFF DIMENSIONS

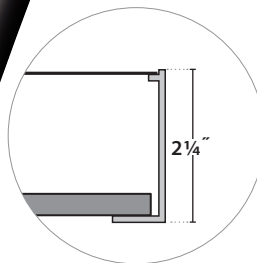




SOFT EDGE

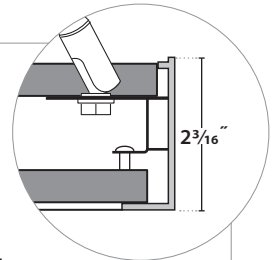


HARD EDGE



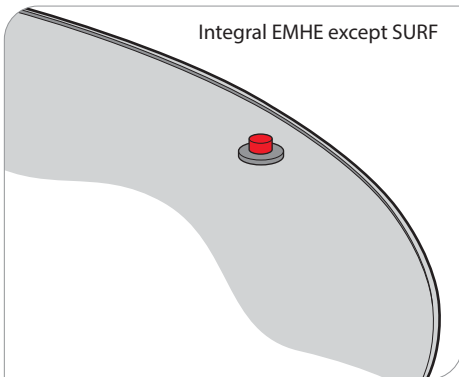
**Gaze Acoustic**

Gaze Acoustic fixtures offer effective noise reduction with an intentional approach to design. Alternate with coordinating light fixtures for maximum visual appeal in open spaces.

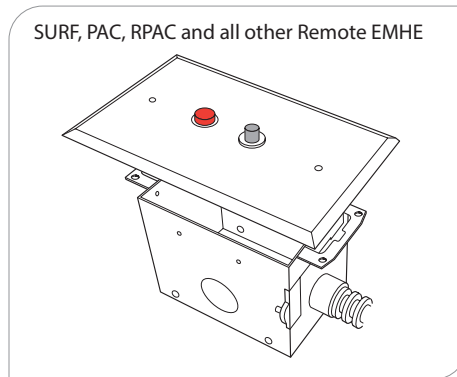




**EMHE TEST LIGHT**

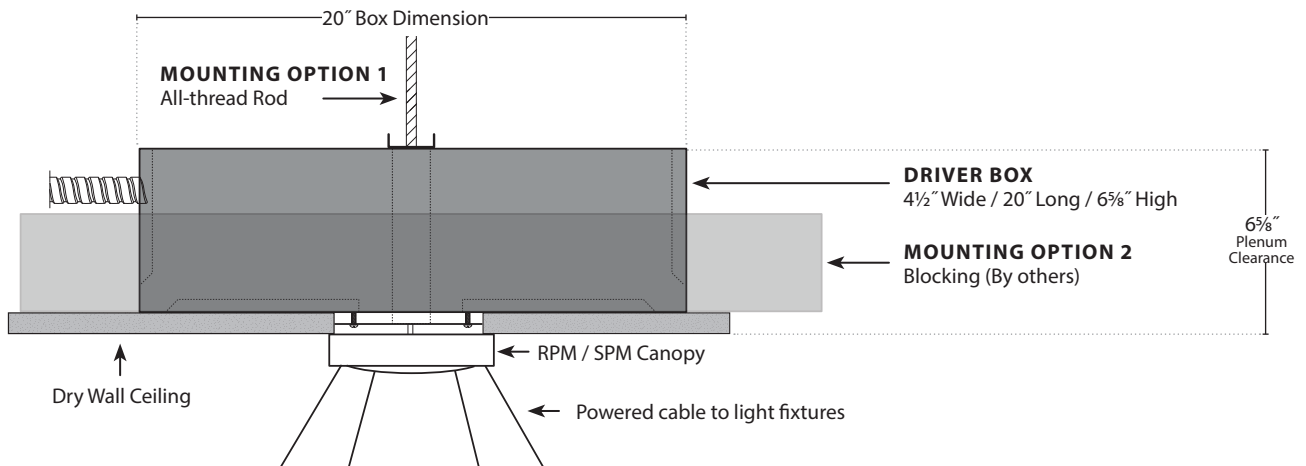


**RTK: REMOTE TEST KIT**

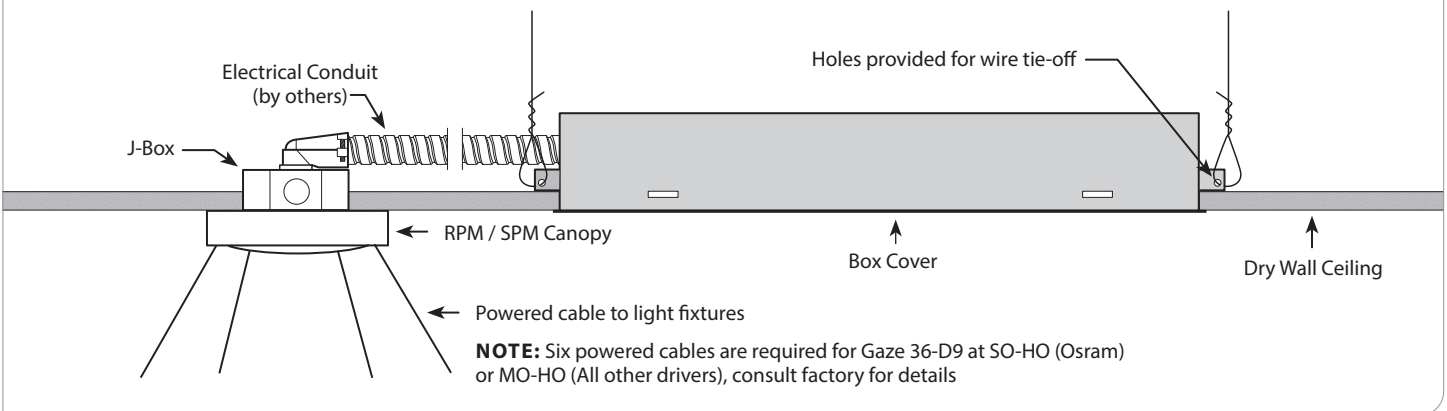


**PACS AND RPAC CROSS SECTIONS**

**DIRECT CANOPY MOUNT:** Canopy Driver Box — Driver access behind canopy



**REMOTE:** Remote Driver Box — Remote access required



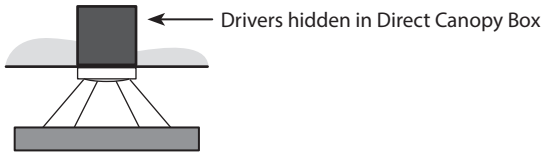


# Gaze | Pendant & Surface Square



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### PAC: POWER VIA AIRCRAFT CABLE (NO POWER CORD)

	D1 DIRECT ONLY				D9: DIRECT/INDIRECT																				
	LO	MO	SO	HO	LO/LO	LO/MO	LO/SO	LO/HO	MO/LO	MO/MO	MO/SO	MO/HO	SO/LO	SO/MO	SO/SO	SO/HO	HO/LO	HO/MO	HO/SO	HO/HO					
18																					O	O	O	O	
24				O																	NA	O	O	NA	NA
36			NA	NA					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
48		O	NA	NA	O	O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

**O:** Osram DM01 Drivers Only, RPAC (Remote) needed for all other drivers     **NA:** Not Available, RPAC (Remote) needed

### RPAC

	D1 DIRECT ONLY				D9: DIRECT/INDIRECT																			
	LO	MO	SO	HO	LO/LO	LO/MO	LO/SO	LO/HO	MO/LO	MO/MO	MO/SO	MO/HO	SO/LO	SO/MO	SO/SO	SO/HO	HO/LO	HO/MO	HO/SO	HO/HO				
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
36	1	1	1	2	1	1	1	1	1	1	2	2	1	2	NA	NA	2	2	NA	NA	2	2	NA	NA
48	1	1	2	NA	1	1	1	2	1	2	NA	NA	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

### RPAC + EMHE

	D1 DIRECT ONLY				D9: DIRECT/INDIRECT																			
	LO	MO	SO	HO	LO/LO	LO/MO	LO/SO	LO/HO	MO/LO	MO/MO	MO/SO	MO/HO	SO/LO	SO/MO	SO/SO	SO/HO	HO/LO	HO/MO	HO/SO	HO/HO				
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2
36	1	1	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
48	1	2	2	NA	1	2	2	2	2	2	NA	NA	3	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

**1:** 1 Remote Box needed     **2:** 2 Remote Box needed     **3:** 3 Remote Box needed     **—:** Not Applicable, no remote box needed

WA

Project:

Location:

Fixture Type:

Catalog Number:

**AVAILABLE FINISHES:**



# Lightstick

WS-47961

**PRODUCT DESCRIPTION**

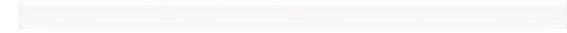
Modern and ultra-minimal. Lightstick is a slim LED vanity luminaire designed perfectly for residential, hospitality and commercial powder rooms. A slender bar of light constructed from a co-extrusion of clear and white acrylic affords the luxurious dimensional look of cased glass but durable enough for its dramatic proportions. The versatile design allows it to be placed horizontally or vertically or even at angles on walls and ceilings.

**FEATURES**

- ACLED driverless technology
- Co-extruded acrylic diffuser
- 1" slim junction box included and can be ordered separately (model# JB-0501)
- Conversion plate included for 4" junction box

**SPECIFICATIONS**

<b>Rated Life</b>	54000 Hours
<b>Standards</b>	ETL, cETL,Damp Location Listed, Title 24 JA8: 2019 Compliant
<b>Input</b>	120 VAC,50/60Hz
<b>Dimming</b>	ELV
<b>Mounting</b>	Can be mounted on ceiling or wall in all orientations
<b>Color Temp</b>	3000K
<b>CRI</b>	90
<b>Construction</b>	Aluminum hardware, co-extruded acrylic diffuser



WS-47961

**REPLACEMENT PARTS**

JB-0501 - 1" Slim Junction Box

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
WS-47961 61"	3000K 3000K	AL Brushed Aluminum WT White	45.9W 45.9W	3651 3651	2826 2826

Example: **WS-47961-WT**

For custom requests please contact [customs@modernforms.com](mailto:customs@modernforms.com)





# VISION VPF4

WB

Vandal Resistant

VPF4 Series LED

Fixture Type	Date
Job Name	Approved By
Catalog Number	

## SPECIFICATIONS



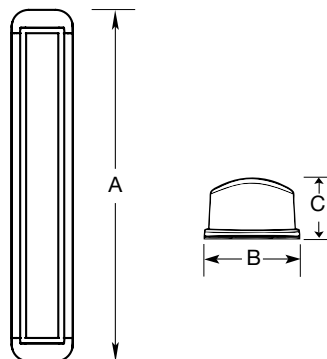
ADA  
ADA Compliant



- Description** The Vision VPF4 series features an all aluminum, ligature resistant construction which allows it to be used in nearly any environmental condition. Designed in conjunction with an ophthalmologist, the polycarbonate lens provides complete control of glare and LED image while maintaining the high efficiency of clear optical material. The Vision VPF4 series can be row mounted to any length. Natatorium finish is standard for all versions of this fixture.
- Housing** Marine grade heat treated extruded aluminum. Finished with Super Durable Corrosion Resistant powder coat (SDCR) that meets AAMA 2605 high performance specification, providing superior UV durability and corrosion resistance. Salt spray test: 4,000 hours.
- Lens** Extruded UV stabilized polycarbonate with integral prisms. Maximum wall thickness 0.160". Secured to housing with die cast aluminum clamps and stainless steel TORX® head screws.
- End Caps** Die cast marine grade aluminum with conduit knockouts that are visible from interior of end cap.
- Drivers** Dimming to 1%, 10% or Programable Lumen Output driver options. Non-Dimming Driver is also available.
- LED** Samsung LM561B+ series @ 2700K, 3000K, 3500K, 4000K, or 5000K and 82 CRI wired in parallel-series. L<sub>70</sub> projected life of over 130,000 hours at 50°C.
- UL Listing** U.L., C.UL. Damp Location Listing standard, Wet Location Listing optional.
- Buy American** Luminaire LED, LLC products are assembled in the USA. Our products meet the Buy America(n) government procurement requirements under FAR, DFARS, and DOT. Please refer to [www.acuitybrands.com/buy-american](http://www.acuitybrands.com/buy-american) for additional information.
- Warranty** **Lifetime** warranty against vandalism. Luminaire LED will repair or replace any fixture damaged due to vandalism for the lifetime of the installation.  
**10-year** warranty on LED boards against operational defects. Tested in accordance with LM-80.
- Note** Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

## DIMENSIONAL DATA

	A	B	C
VPF4 1FT	15.50	4.35	2.70
VPF4 2FT	26.10	4.35	2.70
VPF4 3FT	37.88	4.35	2.70
VPF4 4FT	49.69	4.35	2.70



## ORDERING INFORMATION

Example: VPF4 4FT MIN1 40W 27K 120 CLP WHT

Series*	Size (Nominal)* <sup>1</sup>	Drivers*	Wattage (Nominal) <sup>1</sup>	Lumens (For PRD Only)	CCT*
VPF4 Vandal Resistant 4" Wide Wraparound Luminaire	1FT	MIN1 <sup>2,3</sup> Dimming to 1%	5W 20W 40W	500LM - 5800LM - Lumens available in 100LM increments <i>Lumens required if PRD driver chosen</i>	27K 2700K
	2FT	MIN10 <sup>2,4</sup> Dimming to 10%	10W 25W 50W		30K 3000K
	3FT	NODIM Non-Dimming Driver	15W 30W		35K 3500K
	4FT	PRD <sup>5</sup> Driver Programmed to Specific Lumen Output, Consult Factory <i>PRD not available with Wattage. PRD standard 0-10V dimming to 1%</i>	<i>Required for all drivers except PRD driver</i>		40K 4000K 50K 5000K

Voltage*	Lens*	Finish*
120 120 Volt	CLP Clear Prismatic	BLK Black
277 277 Volt	OP Opal	WHT White
MVOLT 120-277 Volt		BRZ Bronze
347 <sup>3</sup> 347 Volt		GRY Gray
		SIL Silver
		CUST Custom Color, Consult Factory
		RALTBD Ral Paint finishes <i>RALTBD for pricing only. Replace with applicable RAL call out when ready to order. See the RAL BROCHURE for available options</i>

\*Required

## OPTIONS

Emergency <sup>4</sup>	
EMB310 <sup>3</sup> Self contained, 90 minute emergency battery pack. 0°C (32°F) to 55°C (131°F). 1200 lumens	EMB20R <sup>6,7</sup> Remote mounted micro inverter that will operate a 25W maximum load for 90 min. 0°C (32°F) to 45°C (113°F).
EMB310ST <sup>3</sup> Self-testing, self contained, 90 minute emergency battery pack. 0°C (32°F) to 55°C (131°F). Meets CA Title 20 Standards. 1000 lumens	EMB125R <sup>6</sup> Remote inverter that will operate a maximum 125W load for 90 min. 20°C (68°F) to 30°C (86°F).
EMB10ST <sup>3</sup> Self-testing, self contained, 90 minute emergency battery pack. 0°C (32°F) to 55°C (131°F). Meets CA Title 20 Standards. 1000 lumens	EMB250R <sup>6</sup> Remote inverter that will operate a 250W maximum load for 90 min. 20°C (68°F) to 30°C (86°F).
EMB310T2 <sup>3</sup> Self contained, 90 minute emergency battery pack. 0°C (32°F) to 55°C (131°F). Meets CA Title 20 standards. 1200 lumens	EMB375R <sup>6</sup> Remote inverter that will operate a 375W maximum load for 90 min. 20°C (68°F) to 30°C (86°F).

Pendant Type/Length	Back Box	Environment	Fusing	Photocell	Sensors
Rigid Stems RG_ <sup>8,9</sup> (12" - 96") <i>Order in 12" increments up to 96".</i>	COR Corner mounted back box	WL <sup>8,9</sup> Wet Location	GLR <sup>10</sup> Fuse and Fuse Holder	PC <sup>10</sup> Photoelectric Switch	OCCBT <sup>4,5,11</sup> Bluetooth connected microwave occupancy sensor mounted behind the lens. All LED board sensed to dim to 50%, 40%, 30%, 20%, or 10%, field selectable low levels.

Mounting Hardware	Hardware
DRPCP <sup>8,9</sup> Aluminum drip cap finished with white polyester powder coat to be used when pendant mounted	PHSC Phillips Head instead of TORX <sup>®</sup> head

### Ordering Notes

- See Size and Wattage Chart.
- Not available with 5W or 10W.
- Not available with 1FT, 2FT or 3FT.
- Not available with 347V.
- Not available with 1FT.
- Not available with MVOLT.
- Not available with Lumens over 1900 LM.
- Not available with COR.
- WL and DRPCP is required with Rigid Stems (RG\_).
- Not available with MVOLT or 347.
- Not available with any Emergency Battery Pack.

**Accessories:** Order as separate catalog number.

TXSD TORX<sup>®</sup> Screwdriver Bit

*Initial shipment includes one (1) TXSD per fixture*



## SIZE & WATTAGE CHART

Size	Wattage
1FT	5W   10W
2FT	15W   20W
3FT	20W   30W
4FT	25W   40W   50W

## SIZE & LUMEN CHART (FOR PRD)

Size	Lumen Range
2FT	400LM - 2400LM
3FT	800LM - 3200LM
4FT	1000LM - 5800LM

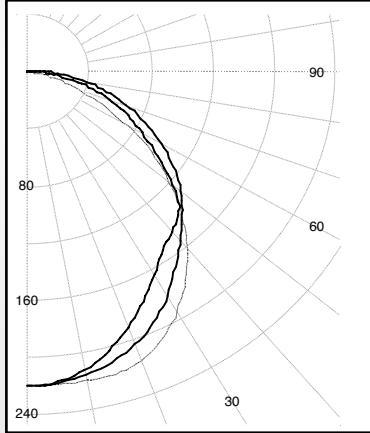
## PHOTOMETRIC DATA

Model	Watts	Input Watts	Delivered Lumens		Delivered Lumens		Delivered Lumens		Delivered Lumens		Delivered Lumens	
			Clear	Opal	Clear	Opal	Clear	Opal	Clear	Opal	Clear	Opal
			2700K		3000K		3500K		4000K		5000K	
VPF4 1FT	5W	7.5W	628	581	635	586	648	599	669	619	688	637
VPF4 1FT	10W	10.4W	898	814	907	841	927	859	956	866	984	912
VPF4 2FT	15W	14.0W	1193	1106	1206	1118	1231	1142	1270	1177	1308	1212
VPF4 2FT	20W	21.0W	2166	2007	2189	2029	2235	2071	2305	2136	2374	2200
VPF4 3FT	20W	20.2W	2111	1966	2134	1987	2178	2028	2246	2092	2313	2155
VPF4 3FT	30W	31.1W	2965	2748	2998	2778	3060	2835	3155	2924	3249	3011
VPF4 4FT	25W	26.9W	2814	2608	2845	2636	2903	2690	2994	2775	3083	2858
VPF4 4FT	40W	42.2W	4332	4015	4380	4061	4470	4144	4609	4272	4748	4400
VPF4 4FT	50W	54.6W	4947	4584	5320	4929	5428	5030	5598	5189	5765	5344
VPF4 xFT	PRD		Programmable Driver. Specify Delivered Lumens in Ordering Information, see Chart above.									

## PHOTOMETRIC DATA

### MODEL VPF4 1FT 5W 40K CLP

Delivered Lumens: 619 Lumens



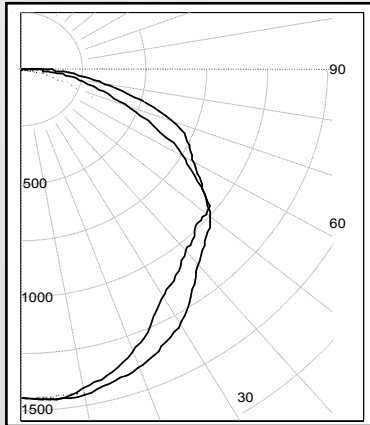
Total Power: 7.5W

Testing was performed in accordance with IES LM-79-08

Zone	Lumens	% Lamps
0 - 30	169	27.3
0 - 40	273	44.1
0 - 60	479	77.3
60 - 90	136	21.9
0 - 90	615	99.3
90 -180	5	0.7
0 - 180	619	100.0

### MODEL VPF4 4FT 40W 40K CLP

Delivered Lumens: 4,268 Lumens



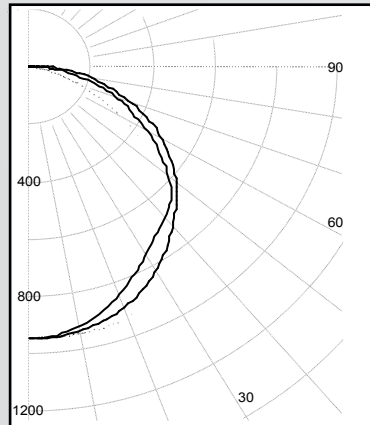
Total Power: 42.2W

Testing was performed in accordance with IES LM-79-08

Zone	Lumens	% Lamps
0 - 30	1127	26.4
0 - 40	1828	42.8
0 - 60	3258	76.3
60 - 90	980	23.0
0 - 90	4238	99.3
90 -180	31	0.7
0 - 180	4268	100.0

### MODEL VPF4 4FT 25W 40K CLP

Delivered Lumens: 2,772 Lumens



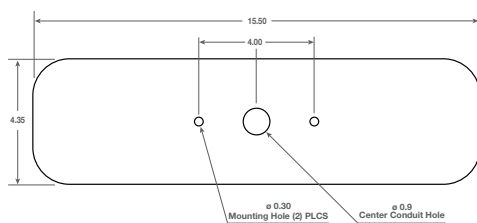
Total Power: 26.9W

Testing was performed in accordance with IES LM-79-08

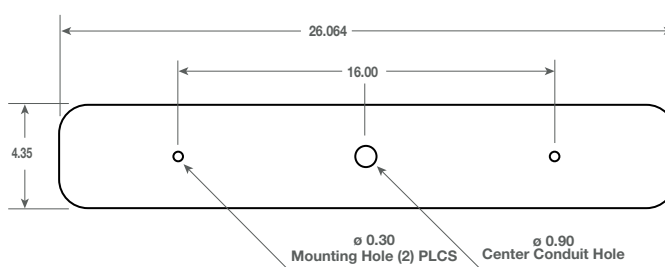
Zone	Lumens	% Lamps
0 - 30	733	26.4
0 - 40	1194	43.1
0 - 60	2116	76.3
60 - 90	633	22.8
0 - 90	2749	99.2
90 -180	24	0.8
0 - 180	2772	100.0

## MOUNTING PLATE DETAILS

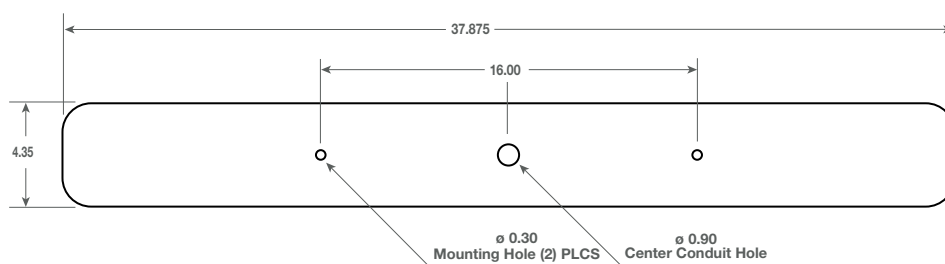
**VPF4 1FT**



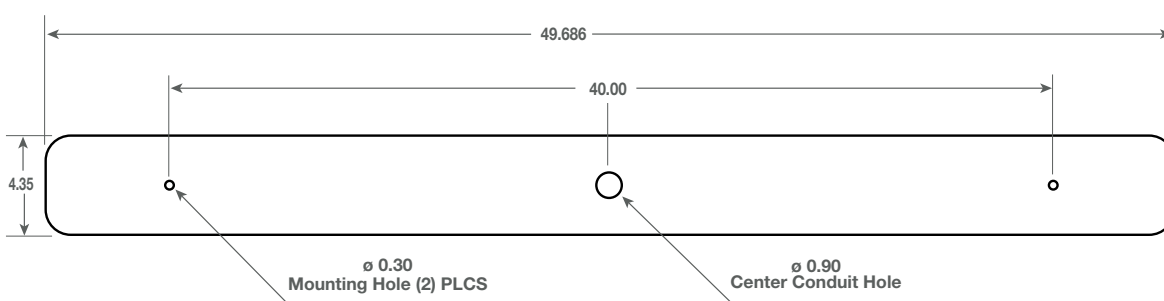
**VPF4 2FT**



**VPF4 3FT**



**VPF4 4FT**



# BeveLED Mini® Complete - B3RD

## 3" Round Downlight

RB



### Universal and Field Convertible - Trim | Trimless | Millwork

Trimmed - B3RDF



Trimless - B3RDL



Millwork - B3RDM



Trimless Acoustical Tile - B3RDP



[usailighting.com/bevedmini](http://usailighting.com/bevedmini)

To specify Trimless Acoustical Lighting visit [usailighting.com/B3RDP](http://usailighting.com/B3RDP)

**Introducing new and improved BeveLED Mini, the smallest member of our iconic BeveLED family.** BeveLED Mini has been infused with upgraded performance for superior light in every application. Now available with the following features, by popular demand:

#### FEATURES

- Upgraded performance and more LED color options than ever before!
- Field Flexibility - it's now easy to change trim in the field between trimmed, trimless and millwork
- Dry/damp/wet location rated for bathrooms and showers, including trimless and millwork
- More dimming options and all color technologies available
- Clear overspray protector for installation convenience
- Full family platform
- Iconic beveled look

#### DOWNLIGHT PERFORMANCE DATA

#### LED COLOR CHOICES

DELIVERED* PERFORMANCE:	Classic White			Warm Glow Dimming		Color Select	
	9W	15W	20W	15W	20W	12W	18W
Source Lumens:	1175	1825	2475	1350	1800	925	1200
Lumens Per Watt:	102	102	97	68	66	65	57
Delivered Lumens:	925	1425	1950	1025	1375	775	1050
EM Mode Output:	950 Delivered Lumens (nominal)			500 Delivered Lumens		500 Delivered Lumens	

\*Based on 3000K, 80+ CRI. Performance varies for each specific beamspread and color temperature. See IES files for exact values at [usailighting.com](http://usailighting.com)

#### CORRELATED COLOR TEMPERATURE MULTIPLIER

	Classic White											
	2700K			3000K			3500K			4000K		
Color Rendering Index:	80+	90+	95+	80+	90+	95+	80+	90+	95+	80+	90+	95+
Multiplier for Lumen	0.96	0.81	0.70	1.00	0.86	0.74	1.03	0.88	0.79	1.06	0.81	0.81

	Warm Glow Dimming				Color Select						
	2700K		3000K		2200K	2700K	3000K	3500K	4000K	5000K	6000K
Color Rendering Index:	80+	90+	80+	90+	80+	80+	80+	80+	80+	80+	80+
Multiplier for Lumen	1.00	0.78	1.00	0.83	0.92	0.97	1.00	1.03	1.05	1.10	1.13

Page 1

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 Revised 10/27/2022

# BeveLED Mini® Complete - B3RD

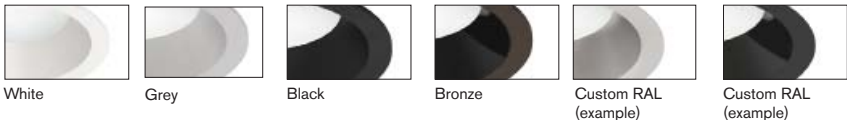
## 3" Round Downlight with Integral Driver Housings

Specify fixture part number. (All boxes must be filled in to correctly order)

B3RD__													
BeveLED Trim Style	Wattage Options	LED Color Options	Beam Options	Lens Options	Bevel Trim Finish Options	*Flange/Millwork Collar Finish	Natatorium Corrosion Protection (optional)	Housing Options	Voltage Options <small>Select one</small>	Dimming Driver Options	Accessories (Optional)*		
<b>F</b> Trimmed with Flange (use with all materials)  <b>L</b> Trimless Spackle-in (use with sheetrock and plaster only)  <b>M</b> Millwork Knife-Edge (use with wood and stone)	<b>Classic White Light</b>			<b>S</b> Solite (provided standard)  <b>SF</b> Solite Frosted  <b>BF</b> Borosilicate Frosted	<b>WH</b> White	<b>WH</b> White	<b>NT</b> Natatorium triple-coat Corrosion resistant (available with "F" flanged trims and painted finishes only) (7)  * Leave blank for non Natatorium trims	<b>FT</b> Flat Housing New Construction (1, 2)  <b>FTIC</b> Flat Housing IC-Rated (up to 15W maximum) (1, 2)  <b>FTA</b> Flat Adjustable Housing  <b>FTAIC</b> Flat Adjustable Housing, IC-Rated (15W maximum)  <b>NC1</b> New Construction All-in-One  <b>NCCP</b> Chicago Plenum  <b>NCIC</b> Insulation Contact Rated / Airtight  <b>FTCT</b> Flat Housing for Color Technologies (FTCT not available with Color Select in trimless or millwork)	<b>UNV</b> 120V-277V	<b>For use with Universal Voltage 120V - 277V</b>  No Additional Charge <b>D22</b> ERP 0-10V, 1% (2) <b>D6E</b> EldoLED 0-10V, 1% (4, 9) <b>D6F</b> EldoLED 0-10V, 1% (4, 9) <b>D4H</b> Lutron H ECO, 1% Fade (1, 2, 4, 9) <b>D4</b> Lutron 3-wire/Eco, 1% (4, 9, 10) <b>D6A</b> EldoLED 0-10V, 0.1% (4, 9) <b>D6B</b> EldoLED 0-10V, 0.1% (4, 9) <b>D7</b> EldoLED DALI, 0.1% (4, 9) <b>D28</b> EldoLED DMX, 0.1% (4, 9) <b>D30</b> EldoLED DALI2 w/ Lutron Athena RF Node, 1% (1, 2, 11)	<b>CB27</b> 27" C-Channel Bars  <b>CB32</b> 32" C-Channel Bars  <b>CB52</b> 52" C-Channel Bars  <b>EM</b> Emergency Battery (6)  <b>EMW</b> Emergency Battery Wet Location (6)  * Residential grade nailer bars provided standard		
	<b>09X3</b> 9W LED	<b>27KS</b> 2700K, 80+ CRI	<b>40</b> 40° beam		<b>SC</b> Conduit Silver	<b>SC</b> Conduit Silver						<b>AB</b> Piano Gloss Black  <b>WH</b> White  <b>GR</b> Grey  <b>BL</b> Black  <b>BZ</b> Bronze  <b>RAL</b> Custom Color Specify RAL #	*Leave blank for Trimless
	<b>15X3</b> 15W LED	<b>27KH</b> 2700K, 90+ CRI	<b>55</b> 55° beam		<b>GR</b> Grey	<b>GR</b> Grey							
	<b>20X3</b> 20W LED (8)	<b>27KU</b> 2700K, 95+ CRI	<b>65</b> 65° beam		<b>BL</b> Black	<b>BL</b> Black							
		<b>30KS</b> 3000K, 80+ CRI			<b>BZ</b> Bronze	<b>BZ</b> Bronze							
		<b>30KH</b> 3000K, 90+ CRI			<b>PR</b> Primer Finish	<b>PR</b> Primer Finish							
		<b>30KU</b> 3000K, 95+ CRI			<b>QW</b> Antimicrobial Paint, White	<b>QW</b> Antimicrobial Paint, White							
		<b>35KS</b> 3500K, 80+ CRI			<b>AC</b> Clear Matte Anodized	<b>AC</b> Clear Matte Anodized							
		<b>35KH</b> 3500K, 90+ CRI			<b>WH</b> White	<b>WH</b> White							
		<b>35KU</b> 3500K, 95+ CRI			<b>BL</b> Black	<b>BL</b> Black							
		<b>40KS</b> 4000K, 80+ CRI			<b>GR</b> Grey	<b>GR</b> Grey							
		<b>40KH</b> 4000K, 90+ CRI			<b>BZ</b> Bronze	<b>BZ</b> Bronze							
	<b>40KU</b> 4000K, 95+ CRI		<b>RAL</b> Custom Color Specify RAL #	<b>RAL</b> Custom Color Specify RAL #									
<b>Warm Glow Dimming</b>									<b>120V</b>	<b>For use with 120V only</b>  No Additional Charge <b>D22</b> ERP Phase 2-wire, 1% (2) <b>D19</b> Phase 2-wire, 1% (1, 2)			
<b>15WG3</b> 15W LED	<b>2722KS</b> 2700K-2200K, 80+ CRI	<b>45</b> 45° beam	<b>WH</b> White	<b>WH</b> White				<b>347V</b>			<b>For use with 347V only</b>  <b>D15</b> 0-10V dim, 1% 347V only (1, 2, 3, 4, 9)		
<b>20WG3</b> 20W LED (8)	<b>2722KH</b> 2700K-2200K, 90+ CRI	<b>55</b> 55° beam	<b>GR</b> Grey	<b>GR</b> Grey									
	<b>3022KS</b> 3000K-2200K, 80+ CRI	<b>65</b> 65° beam	<b>BL</b> Black	<b>BL</b> Black									
	<b>3022KH</b> 3000K-2200K, 90+ CRI												
<b>Color Select Tunable White</b>													
<b>12CS1</b> 12W LED (9)	<b>6022KS</b> 6000K-2200K, Tunable White Light 80+ CRI	<b>45</b> 45° beam											
<b>18CS1</b> 18W LED (5, 8, 9)		<b>55</b> 55° beam											
		<b>65</b> 65° beam											
Note: Color Select option requires additional 0-10V dimming wires; see wiring diagrams for details													

Notes:  
 1 Not available for Warm Glow.  
 2 Not available for Color Select  
 3 Not available with 9W  
 4 Not available with FT or FTIC housing  
 5 Not available with NCIC housing  
 6 Not available with 347V. NC1 housing only. Requires above ceiling access for service  
 7 Not available in trimless and millwork  
 8 Not available with FTIC or FTAIC housing  
 9 Not available in FTCT housing with trimless or millwork  
 10 Not available with Classic White. Warm Glow and Color Select only.  
 11 NC1 housing only.

### TRIM FINISH OPTIONS



Custom colors and primer finish also available

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 13 Crosby Street  
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 Revised 10/27/2022

# BeveLED Mini® Complete - B3RD

## 3" Round Downlight with Remote Driver

1. Specify fixture part number. (All boxes must be filled in to correctly order)

B3RD__									RM	
BeveLED Trim Style	Wattage Options	LED Color Options	Beam Options	Lens Options	Bevel Trim Finish Options	*Flange/Millwork Collar Finish	Natorium Corrosion Protection (optional)	Housing Options	Remote Dimming Driver	Accessories (Optional)
<b>F</b> Trimmed with Flange (use with all materials)  <b>L</b> Trimless Spackle-in (use with sheetrock and plaster only)  <b>M</b> Millwork Knife-Edge (use with wood and stone)	<b>Classic White Light</b>		<b>40</b> 40° beam  <b>55</b> 55° beam  <b>65</b> 65° beam	<b>S</b> Solite (provided standard)  <b>SF</b> Solite Frosted  <b>BF</b> Borosilicate Frosted	<b>WH</b> White	<b>WH</b> White	<b>NT</b> Natorium triple-coat Corrosion resistant (available with "F" flanged trims and painted finishes only)	<b>FT</b> Flat Housing New Construction  <b>FTIC</b> Flat Housing IC-Rated (up to 15W maximum)  <b>FTA</b> Flat Adjustable Housing  <b>FTAIC</b> Flat Adjustable Housing, IC-Rated (15W maximum)  <b>NC1</b> New Construction All-in-One  <b>NCCP</b> Chicago Plenum  <b>NCIC</b> Insulation Contact Rated / Airtight  <b>FTCT</b> Flat Housing for Color Technologies	<b>RM</b> Remote Dimming Driver, specify remote power supply in table below	<b>CB27</b> 27" C-Channel Bars  <b>CB32</b> 32" C-Channel Bars  <b>CB52</b> 52" C-Channel Bars  * Residential grade nailer bars provided standard
	<b>09X3</b> 9W LED  <b>15X3</b> 15W LED  <b>20X3</b> 20W LED (1)	<b>27KS</b> 2700K, 80+ CRI  <b>27KH</b> 2700K, 90+ CRI  <b>27KU</b> 2700K, 95+ CRI  <b>30KS</b> 3000K, 80+ CRI  <b>30KH</b> 3000K, 90+ CRI  <b>30KU</b> 3000K, 95+ CRI  <b>35KS</b> 3500K, 80+ CRI  <b>35KH</b> 3500K, 90+ CRI  <b>35KU</b> 3500K, 95+ CRI  <b>40KS</b> 4000K, 80+ CRI  <b>40KH</b> 4000K, 90+ CRI  <b>40KU</b> 4000K, 95+ CRI			<b>AC</b> Clear Matte Anodized  <b>WH</b> White  <b>BL</b> Black  <b>GR</b> Grey  <b>BZ</b> Bronze	<b>SC</b> Conduit Silver  <b>GR</b> Grey  <b>BL</b> Black  <b>BZ</b> Bronze  <b>PR</b> Primer Finish  <b>QW</b> Antimicrobial Paint, White  <b>AB</b> Piano Gloss Black				
	<b>Warm Glow Dimming</b>		<b>45</b> 45° beam  <b>55</b> 55° beam  <b>65</b> 65° beam		<b>RAL</b> Custom Color Specify RAL #	<b>RAL</b> Custom Color Specify RAL #				
	<b>15WG3</b> 15W LED  <b>20WG3</b> 20W LED (1)	<b>2722KS</b> 2700K-2200K, 80+ CRI  <b>2722KH</b> 2700K-2200K, 90+ CRI  <b>3022KS</b> 3000K-2200K, 80+ CRI  <b>3022KH</b> 3000K-2200K, 90+ CRI				*Leave blank for Trimless				

Notes:  
1 Not available with FTIC or FTAIC housing

USAI  
Power Supply  
Must Be Specified

2. Specify Remote Power Supply

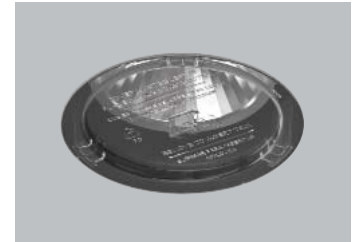
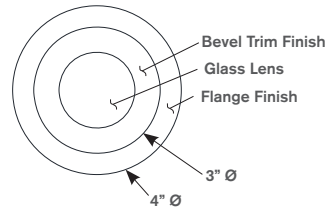
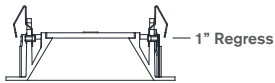
RPB-01					
Remote Power Supply	Wattage Options	Voltage	Remote Dimming Type and Level	Remote Emergency Option	Remote Driver Mounting Accessories*
<b>RPB-01</b> BeveLED Mini Remote Power Supply	<b>Classic White</b>	<b>UNV</b> 120V - 277V	<b>D4H</b> Lutron H ECO, 1% Fade (1) <b>D4</b> Lutron 3-wire/Eco, 1% (2) <b>D6A</b> EldoLED 0-10V, 0.1% <b>D6B</b> EldoLED 0-10V, 0.1% <b>D6E</b> EldoLED 0-10V, 1% <b>D6F</b> EldoLED 0-10V, 1% <b>D7</b> EldoLED DALI, 0.1% <b>D28</b> EldoLED DMX, 0.1%	<b>EM7</b> EM battery requires remote enclosure by others, minimum size 14.5" L x 6.5" W x 3" H (3, 4)	<b>MP</b> Junction Box Mounting Plate, 5-1/8" x 5-1/8"  <b>ENC</b> Single Driver enclosure, 4-1/8" x 9-11/16" x 2-3/8"
	<b>Warm Glow</b>		<b>120V</b> 120V Only		
	<b>15WG3</b> 15W LED  <b>20WG3</b> 20W LED		1 Not available for Warm Glow. 2 Not available with Classic White. For use with Warm Glow only. 3 Not available with MP jbox accessory 4 Not available with ENC single driver enclosure; enclosure by others required.		* If Remote Driver Mounting Accessories selection is left blank, driver will be provided with accessories for mounting in enclosure by others. See page 7 for remote driver enclosure sizing requirements.

# BeveLED Mini® Complete - B3RD 3" Round Downlight

## Trimmed - B3RDF

### TRIM DETAILS

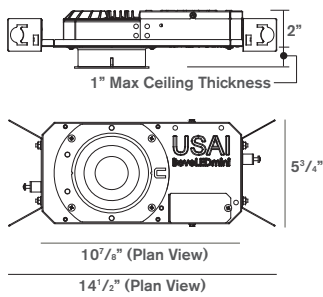
Trimmed - B3RDF



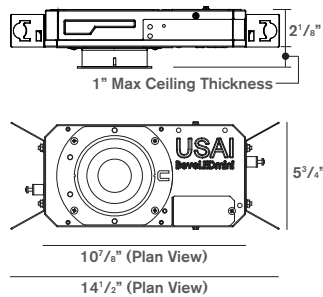
Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

### HOUSING OPTIONS

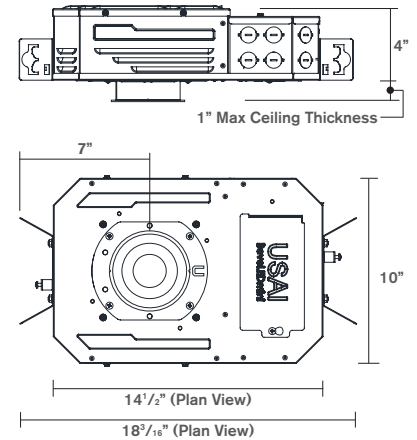
Flat Housing - FT



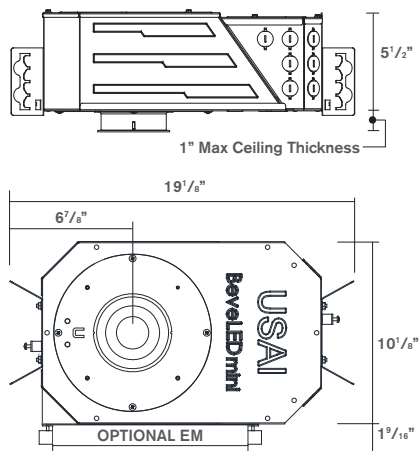
Flat Housing, IC-Rated - FTIC  
(up to 15W maximum)



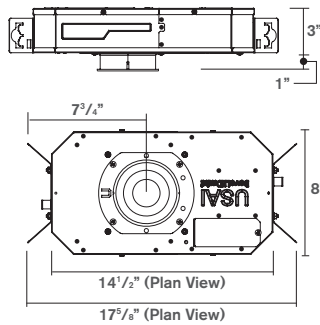
Flat Adjustable Housing - FTA  
Flat Adjustable Housing, IC-Rated - FTAIC  
(up to 15W maximum)



New Construction Housing - NC1  
Insulation-Contact Rated - NCIC  
Chicago Plenum Rated - NCCP



Flat Housing for Color  
Technologies - FTCT



# BeveLED Mini® Complete - B3RD 3" Round Downlight

## Trimless - B3RDL

### TRIM DETAILS

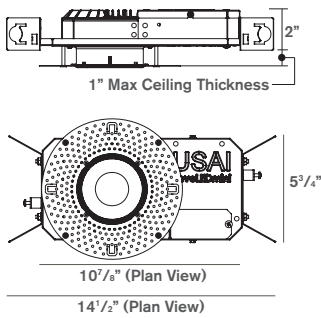
Trimless - B3RDL



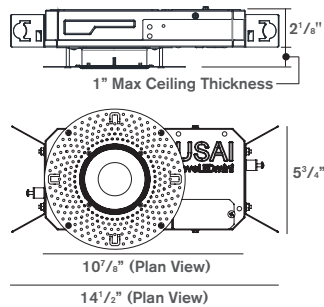
Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

### HOUSING OPTIONS

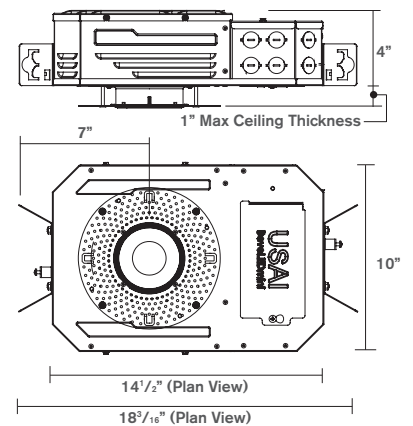
Flat Housing - FT



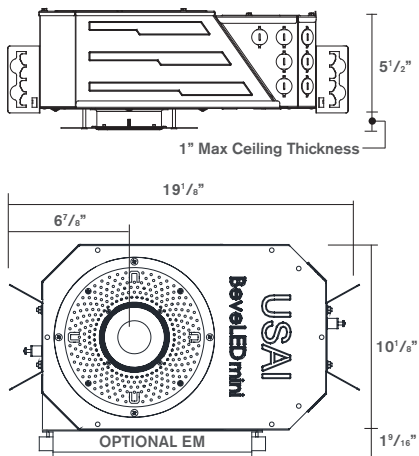
Flat Housing, IC-Rated - FTIC  
(up to 15W maximum)



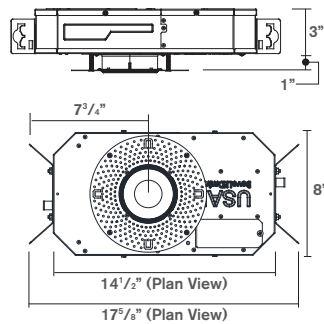
Flat Adjustable Housing - FTA  
Flat Adjustable Housing, IC-Rated - FTAIC  
(up to 15W maximum)



New Construction Housing - NC1  
Insulation-Contact Rated - NCIC  
Chicago Plenum Rated - NCCP



Flat Housing for Color Technologies - FTCT  
*Trimless is not available with Color Select*



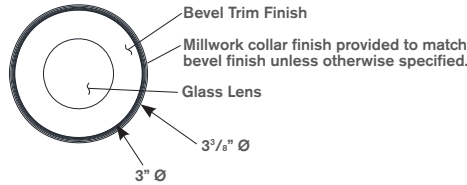
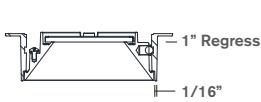


# BeveLED Mini® Complete - B3RD 3" Round Downlight

## Millwork - B3RDM

### TRIM DETAILS

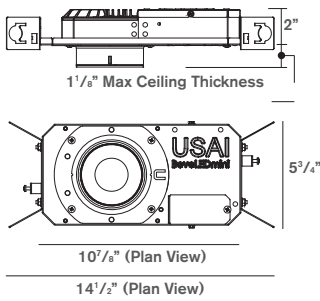
#### Millwork - B3RAM



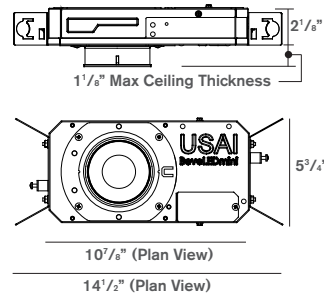
Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

### HOUSING OPTIONS

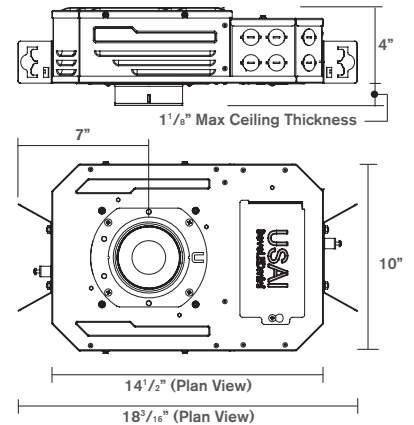
#### Flat Housing - FT



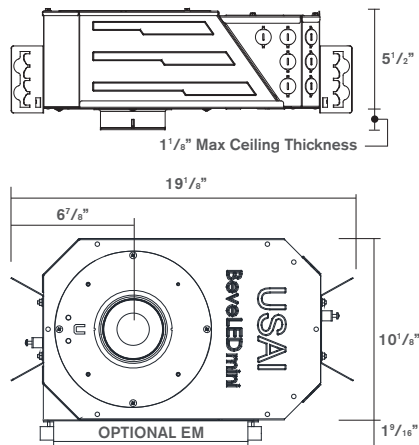
#### Flat Housing, IC-Rated - FTIC (up to 15W maximum)



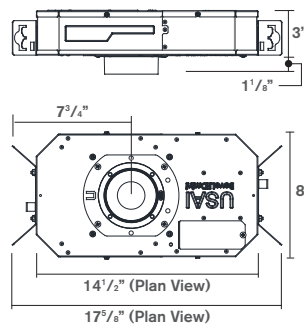
#### Flat Adjustable Housing - FTA Flat Adjustable Housing, IC-Rated - FTAIC (up to 15W maximum)



#### New Construction Housing - NC1 Insulation-Contact Rated - NCIC Chicago Plenum Rated - NCCP



#### Flat Housing for Color Technologies - FTCT *Millwork is not available with Color Select*



# BeveLED Mini® Complete - B3RD

## 3" Round Downlight

### BEVELED MINI SPECIFICATIONS

#### FIELD REPLACEABLE LED LIGHT ENGINE

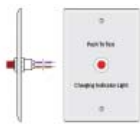
is serviceable through the aperture with a Phillips screwdriver. All USAI Lighting light engines feature industry-leading color consistency.

#### FIELD REPLACEABLE INTEGRAL DRIVER

Unless otherwise specified, a 0-10V, 100%-1% solid state electronic constant current integral D22 dimming driver with a high power factor is provided standard and sources 2mA. All integral dimming drivers are located within the fixture housing and are serviceable from below the ceiling through the aperture. Some on-time delay may be experienced depending on control system used. All dimming drivers comply with IEEE C62.41 surge protection.

#### INTEGRAL EMERGENCY BATTERY

An integral emergency battery pack is available as an option with the NC1 housing and integral driver/power supply only. IOTA emergency battery provides backup power for 90 minutes. NC1 fixtures are provided with an integral emergency battery that requires above ceiling access for service, and a remote test switch, which comes with a 24" lead length for location of the test switch. Remote EM test switch is dry/damp only; select EMW emergency option for a wet location-rated EM test switch. Fixtures that have no USAI EM option may be connected to an inverter (by others) for emergency lighting. Battery is not available with 347V.



**Remote Emergency Test Switch included with NC1 housing and integral driver only.**  
Above ceiling access required for service.

#### REMOTE LOCATION DRIVER

BeveLED Mini is available for use with remotely located driver. Driver is provided separately for remote location on site, enclosure to be provided by others. Remote dimming driver power supply option must be clearly specified in the "RP" table. Remote power supplies require enclosures by others that meet local codes and must be located in an accessible service panel within 100ft of the light fixture; see remote driver table below for coordination of enclosure sizes and wire gauges required. All dimming drivers comply with IEEE C62.41 surge protection.

Remote Power Supply Requirements and Wiring Diagram enclosure sizes and wire gauge with **1 fixture** per power supply.

Remote Power Supply Dimming Option	Wire Gauge Required*	Minimum Enclosure Size Required (by others)		
		RP Only	RP with EM Option**	
<b>RPB-01-09X3</b> <b>RPB-01-15X3</b> <b>RPB-01-20X3</b> <b>RPB-01-15WG3</b> <b>RPB-01-20WG3</b>	<b>UNV-D4H</b> Lutron H ECO, 1% fade (1)	14/12	6.25" W x 4" L x 2" H	14.5" W x 6.5" L x 3" H
	<b>UNV-D4</b> Lutron 3-wire/Eco, 1% (2)			
	<b>UNV-D6A</b> EldoLED 0-10V, 0.1%	18/16		
	<b>UNV-D6B</b> EldoLED 0-10V, 0.1%			
	<b>UNV-D6E</b> EldoLED 0-10V, 1%			
	<b>UNV-D6F</b> EldoLED 0-10V, 1%			
	<b>UNV-D7</b> EldoLED DALI, 0.1%			
	<b>UNV-D28</b> EldoLED DMX, 0.1%			
<b>120V-D19</b> Hatch 2-wire phase, 1% (1)	14/12	5.75" W X 2.625" L x 2" H		

1 Not available for Warm Glow

2 Not available with Classic White. Warm Glow only.

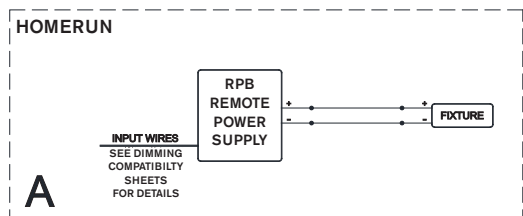
Not all dimming options are available with all LED light engine options. See RP ordering table for details.

\* Wire gauge 14/12 = Maximum distance from light fixture to remote power supply is 100' using 12 gauge wire, 50' using 14 gauge wire.

\*\* Wire gauge 18/16 = Maximum distance from light fixture to remote power supply is 100' using 16 gauge wire, 50' using 18 gauge wire.

\*\* Emergency battery remote power supplies cannot be located any more than 50 feet from light fixture.

Note: All light fixtures must be wired in homeruns per wiring diagram below.



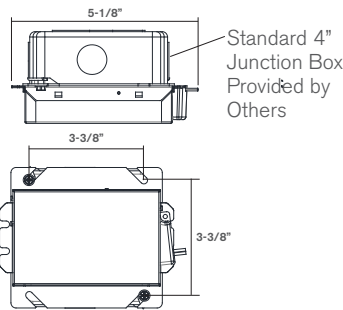
# BeveLED Mini® Complete - B3RD 3" Round Downlight

## BEVELED MINI SPECIFICATIONS

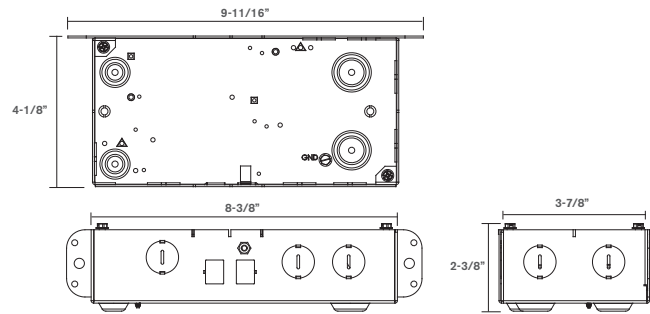
### ENCLOSURES FOR REMOTE DRIVERS

Remote drivers require enclosures per local code. Enclosures can be provided by others, or for convenience, USAI can provide them to you. The choices available depend on the dimming driver specified. In the case of the metal encased drivers, USAI can offer a metal mounting plate sized 5-1/8" x 5-1/8" which attaches to the back of each dimming driver and can be installed directly inside a standard 4" square junction box. For the other dimming drivers we offer, USAI can provide an enclosure sized 4-1/8" wide x 9-11/16" long x 2-3/8" deep to accommodate one dimming driver each. Please refer to remote dimming driver ordering tables for clarification on which driver installation accessories, mounting plate or enclosure, are available for each remote dimming driver option. When choosing to use USAI remote dimming driver mounting accessories, whether enclosures or mounting plates, specify the accessory in the accessories column of the remote dimming driver ordering table to indicate selection. Field wiring should be according to NEC code; per article 411.7. EC is responsible for adherence to all local codes. Refer to remote dimming driver tables for maximum distances, locations, and wire gauges required, which varies by driver type.

### MP JUNCTION BOX MOUNTING PLATE



### ENC SINGLE DRIVER ENCLOSURE



### HOUSING

All BeveLED Mini fixtures are field-flexible which allows for field changes from trimless or millwork to trimmed with a simple components change with parts from USAI. Housings are fabricated of 20 ga. steel construction with thru wire J-box, 4 in 4 out at min. 90°C, #12 AWG thru branch circuit wiring. FTIC and NCIC housing for use with 9W, 12W, and 15W light engines only are rated for direct contact with spray foam insulation of R-42 or less. FTIC and FTAIC housings are IC-rated up to 15W maximum.

### MOUNTING

B3RDF overlap flange fixtures are designed for use in sheetrock, acoustical ceiling tile, and many other ceiling materials. B3RDL trimless fixtures are provided with a spackle collar and are designed for use in sheetrock/mud-in ceiling applications. B3RDM millwork fixtures are provided with a millwork collar and are designed for use in wood/millwork and stone construction applications. Butterfly brackets and residential grade adjustable nailer bars extendible from 14" to 24" centers with integral nails are provided standard for attachment to building structure. C-channel bars are optionally available for acoustical ceiling applications.

### FIXTURE WEIGHT

FT and FTIC housings weigh 4 lbs. FTA, FTAIC and FTCT housings weigh 10 lbs. NC1, NCIC, and NCCP housings weigh 11 lbs. NC1 housing with EM weighs 14 lbs.

### WARRANTY

Based on IESNA LM80-2008, BeveLED has a 50,000 hour rated life at 70% lumen maintenance (L70). USAI Lighting Warranty covers replacement parts for 5 years from date of shipment. Ambient temperatures at fixture location should not exceed 40°C during normal operation.

### CEILING CUT OUT

B3RDF Trimmed with Overlap Flange: 3-5/8"Ø  
 B3RDL Trimless Spackle-in: 4-3/16"Ø  
 B3RDM Millwork Knife-edge: 3-9/16"Ø

### TRIM FINISH

BeveLED Mini trims are available in a wide range of finishes. USAI's standard powdercoat painted trim finishes are white, conduit silver, gray, black, and bronze. A clear matte anodized bevel and piano gloss black electrocoated bevel are also available with matching or contrast-painted flange finish options. Anti-microbial painted finish available in white. Natatorium finishes are triple-coated for corrosion resistance; these coatings are offered in painted finishes only and are not available for trimless or millwork. All trim finishes are dry/damp/wet location rated, with the exception of the anodized (-AC-) and electrocoated (-AB-) bevel finishes, which are dry/damp only. Please contact the USAI factory with a RAL number specification for custom color trims, or specify the field-paintable primer finish option.

# BeveLED Mini® Complete - B3RD

## 3" Round Downlight

### BEVELED MINI SPECIFICATIONS

#### LISTINGS

Dry/Damp/Wet location. Rated for use in steam rooms and saunas, up to 15W maximum; 18W and/or 20W are not for use in steam rooms or saunas. AC and AB trim finishes are dry/damp only. EM test switch is dry/damp only. Select EMW option for wet location remote test switch. UL2043 rated for use in air handling plenums. NRTL/CSA-US tested to UL standards. IBEW union made. All USAI Lighting products are Buy American Act (BAA) compliant.



#### NOTES

- Not for use in corrosive environment
- Use of pressure washer voids warranty

#### PHOTOMETRICS

Consult factory or website for IES files. Tested in accordance with IESNA LM79.

# BeveLED Mini® Complete - B3RD

## 3" Round Downlight

### LED COLOR OPTIONS

#### Classic White Light

Our proprietary LED light engines achieve a 2-step MacAdam ellipse along the black body locus, resulting in reliable and uniform color from fixture to fixture. You'll see the results in consistently beautiful light throughout your space, whichever USAI LED product you specify.



#### Warm Glow® Dimming

Warm Glow Dimming provides warmth and glow once possible only in dimmed incandescent sources. Utilizing our patented proprietary algorithm and circuitry, Warm Glow Dimming technologies precisely mimic the black body curve of a standard 100W A19 lamp by gradually transitioning from 2700K or 3000K down to 2200K. The result is virtually indistinguishable from an incandescent light source.



#### Color Select® Tunable White

Color Select represents the next innovation in color temperature control for advanced LED recessed downlighting. Color Select® products allow users to adjust color temperature from 6000K down to 2200K while independently adjusting intensity to achieve ultimate control over the quality of light in a space with a single fixture type. Color Select interfaces with standard dimming and control systems.



# BeveLED Mini® Complete - B3SW 3" Square Wall Wash

RBB



## Universal and Field Convertible - Trim | Trimless | Millwork

Trimmed - B3SWF



Trimless - B3SWL



Millwork - B3SWM



usailighting.com/bevedmini

**Introducing new and improved BeveLED Mini, the smallest member of our iconic BeveLED family.** BeveLED Mini has been infused with upgraded performance for superior light in every application. Now available with the following features, by popular demand:




### FEATURES

- Upgraded performance and more LED color options than ever before!
- Collar extenders offered standard to accept up to 1-1/2" thick ceilings
- Field Flexibility - it's now easy to change trim in the field between trimmed, trimless and millwork
- Dry/damp/wet location rated for bathrooms and showers, including trimless and millwork
- More dimming options and all color technologies available
- Clear overspray protector for installation convenience
- Full family platform
- Iconic beveled look

### WALL WASH PERFORMANCE DATA

See page 4 for our extensive range of performance values

### LED COLOR CHOICES

	 <b>Classic White</b> <b>9W - 20W</b>	 <b>Warm Glow Dimming</b> <b>15W - 20W</b>	 <b>Color Select</b> <b>12W - 18W</b>
<b>Source Lumens:</b>	1175 - 2475	1350 - 1800	925 - 1200

# BeveLED Mini® Complete - B3SW

## 3" Square Wall Wash with Integral Driver

Specify fixture part number. (All boxes must be filled in to correctly order)

B3SW			W2-D1											
BeveLED Trim Style	Wattage Options	LED Color Options	Beam Options	Bevel Trim Finish Options	*Flange/Millwork Collar Finish	Natorium Corrosion Protection (optional)	Housing Options	Extended Collar for Thick Ceilings*	Voltage Options <i>Select one</i>	Dimming Driver Options	Emergency Battery (Optional)			
<b>F</b> Trimmed with Flange (use with all materials)  <b>L</b> Trimless Spackle-in (use with sheetrock and plaster only)  <b>M</b> Millwork Knife-Edge (use with wood and stone)	<b>Classic White Light</b>		<b>W2-D1</b> Horizontal Wall Wash Optic	<b>WH</b> White	<b>WH</b> White	<b>NT</b> Natorium triple-coat Corrosion resistant (available with "F" flanged trims and painted finishes only)	<b>FT</b> Flat Housing New Construction (1, 2)	(leave blank for standard collar, accepts 1" thick ceiling maximum)  <b>15</b> Extended collar accepts up to 1.5" thick ceilings maximum  * Not available with FT, FTIC, FTCP, FTCT, or FTCTIC housings	<b>UNV</b> 120V-277V	<b>For use with Universal Voltage 120V - 277V</b>  No Additional Charge <b>D6E</b> EldoLED 0-10V, 1% <b>D6F</b> EldoLED 0-10V, 1%  <b>D4H</b> Lutron H Eco, 1% Fade (1, 2, 4) <b>D4</b> Lutron 3-wire/Eco, 1% (3, 4) <b>D6A</b> EldoLED 0-10V, 0.1% <b>D6B</b> EldoLED 0-10V, 0.1% <b>D7A</b> EldoLED DALI2, 0.1% <b>D7E</b> EldoLED DALI2, 1% <b>D28</b> EldoLED DMX, 0.1% (4) <b>D30</b> EldoLED DALI2 w/ Lutron Athena RF Node, 1% (1, 2, 7)	<b>EM</b> Emergency Battery (6)  <b>EMW</b> Emergency Battery Wet Location (6)			
	<b>09X3</b> 9W LED	<b>27KS</b> 2700K, 80+ CRI		<b>SC</b> Conduit Silver	<b>SC</b> Conduit Silver		* Leave blank for non Natorium trims					<b>FTCT</b> Flat Housing for Color Technologies	<b>FTA2</b> Flat Adjustable Housing	<b>NC1</b> New Construction All-in-One
	<b>15X3</b> 15W LED	<b>27KH</b> 2700K, 90+ CRI		<b>GR</b> Grey	<b>GR</b> Grey							<b>FTA2</b> Flat Adjustable Housing		
	<b>20X3</b> 20W LED	<b>27KU</b> 2700K, 95+ CRI		<b>BL</b> Black	<b>BL</b> Black							<b>FTA2</b> Flat Adjustable Housing		
		<b>30KS</b> 3000K, 80+ CRI		<b>BZ</b> Bronze	<b>BZ</b> Bronze							<b>FTA2</b> Flat Adjustable Housing		
		<b>30KH</b> 3000K, 90+ CRI		<b>PR</b> Primer Finish	<b>PR</b> Primer Finish							<b>FTA2</b> Flat Adjustable Housing		
		<b>30KU</b> 3000K, 95+ CRI		<b>QW</b> Antimicrobial Paint, White	<b>QW</b> Antimicrobial Paint, White							<b>FTA2</b> Flat Adjustable Housing		
		<b>35KS</b> 3500K, 80+ CRI		<b>AC</b> Clear Matte Anodized	<b>AC</b> Clear Matte Anodized							<b>FTA2</b> Flat Adjustable Housing		
		<b>35KH</b> 3500K, 90+ CRI		<b>WH</b> White	<b>WH</b> White							<b>FTA2</b> Flat Adjustable Housing		
		<b>35KU</b> 3500K, 95+ CRI		<b>BL</b> Black	<b>BL</b> Black							<b>FTA2</b> Flat Adjustable Housing		
	<b>40KS</b> 4000K, 80+ CRI	<b>GR</b> Grey	<b>GR</b> Grey	<b>FTA2</b> Flat Adjustable Housing										
	<b>40KH</b> 4000K, 90+ CRI	<b>BZ</b> Bronze	<b>BZ</b> Bronze	<b>FTA2</b> Flat Adjustable Housing										
	<b>40KU</b> 4000K, 95+ CRI			<b>FTA2</b> Flat Adjustable Housing										
	<b>Warm Glow Dimming</b>			<b>AB</b> Piano Gloss Black	<b>AB</b> Piano Gloss Black		* For all of the above leave " " blank for standard housing) * Add <b>IC</b> to end of housing codes listed above for insulation contact rated version ( <b>15W max for all except NC1C</b> ) * Add <b>CP</b> to end of housing codes listed above for Chicago Plenum rated version ( <b>not available with FTCT</b> )	<b>120V</b>	<b>For use with 120V only</b>  No Additional Charge <b>D22</b> ERP Phase 2-wire, 1% (2) <b>D19</b> Phase 2-wire, 1% (1, 2)	<b>Mounting Accessories (Optional*)</b>  <b>CB27</b> 27" C-Channel Bars  <b>CB32</b> 32" C-Channel Bars  <b>CB52</b> 52" C-Channel Bars  * Residential grade nailer bars provided standard				
	<b>15WG3</b> 15W LED	<b>2722KS</b> 2700K-2200K, 80+ CRI	<b>WH</b> White	<b>WH</b> White										
	<b>20WG3</b> 20W LED	<b>2722KH</b> 2700K-2200K, 90+ CRI	<b>GR</b> Grey	<b>GR</b> Grey										
		<b>3022KS</b> 3000K-2200K, 80+ CRI	<b>BL</b> Black	<b>BL</b> Black										
		<b>3022KH</b> 3000K-2200K, 90+ CRI	<b>BZ</b> Bronze	<b>BZ</b> Bronze										
	<b>Color Select Tunable White</b>		<b>RAL</b> Custom Color Specify RAL #	<b>RAL</b> Custom Color Specify RAL #										
	<b>12CS1</b> 12W LED	<b>6022KS</b> 6000K-2200K, Tunable White Light 80+ CRI												
	<b>18CS1</b> 18W LED (5)													
	<b>15CS2</b> 15W LED	<b>4827KH</b> 4800K-2700K, Tunable White Light, 90+ CRI												
	Note: Color Select option requires additional 0-10V dimming wires; see wiring diagrams for details													

### TRIM FINISH OPTIONS



Custom colors and primer finish also available

**USAI LIGHTING COLLABORATORY**  
 13 Crosby Street  
 New York, NY 10013  
 845-234-4090  
 showroom@usailighting.com

**USAI LIGHTING HEADQUARTERS**  
 1126 River Road  
 New Windsor, NY 12553  
 T: 845-565-8500  
 info@usailighting.com



# BeveLED Mini® Complete - B3SW

## 3" Square Wall Wash with Remote Driver

1. Specify fixture part number. (All boxes must be filled in to correctly order)

B3SW			W2-D1						RM	
BeveLED Trim Style	Wattage Options	LED Color Options	Beam Options	Bevel Trim Finish Options	*Flange/Millwork Collar Finish	Natatorium Corrosion Protection (optional)	Housing Options	Extended Collar for Thick Ceilings	Remote Dimming Driver	Mounting Accessories (Optional*)
<b>F</b> Trimmed with Flange (use with all materials)  <b>L</b> Trimless Spackle-in (use with sheetrock and plaster only)  <b>M</b> Millwork Knife-Edge (use with wood and stone)	<b>Classic White Light</b> <b>09X3</b> 9W LED <b>15X3</b> 15W LED <b>20X3</b> 20W LED  <b>27KS</b> 2700K, 80+ CRI <b>27KH</b> 2700K, 90+ CRI <b>27KU</b> 2700K, 95+ CRI <b>30KS</b> 3000K, 80+ CRI <b>30KH</b> 3000K, 90+ CRI <b>30KU</b> 3000K, 95+ CRI <b>35KS</b> 3500K, 80+ CRI <b>35KH</b> 3500K, 90+ CRI <b>35KU</b> 3500K, 95+ CRI <b>40KS</b> 4000K, 80+ CRI <b>40KH</b> 4000K, 90+ CRI <b>40KU</b> 4000K, 95+ CRI		<b>W2-D1</b> Horizontal Wall Wash Optic	<b>WH</b> White <b>SC</b> Conduit Silver <b>GR</b> Grey <b>BL</b> Black <b>BZ</b> Bronze <b>PR</b> Primer Finish <b>QW</b> Antimicrobial Paint, White <b>AC</b> Clear Matte Anodized  <b>AB</b> Piano Gloss Black	<b>WH</b> White <b>SC</b> Conduit Silver <b>GR</b> Grey <b>BL</b> Black <b>BZ</b> Bronze <b>PR</b> Primer Finish <b>QW</b> Antimicrobial Paint, White <b>AC</b> Clear Matte Anodized  <b>WH</b> White <b>BL</b> Black <b>GR</b> Grey <b>BZ</b> Bronze <b>AB</b> Piano Gloss Black	<b>NT</b> Natatorium triple-coat Corrosion resistant (available with "F" flanged trims and painted finishes only)  * Leave blank for non Natatorium trims	<b>FT</b> Flat Housing New Construction  <b>FTCT</b> Flat Housing for Color Technologies  <b>FTA2</b> Flat Adjustable Housing  <b>NC1</b> New Construction All-in-One	(leave blank for standard collar, accepts 1" thick ceiling maximum)  <b>15</b> Extended collar accepts up to 1.5" thick ceilings maximum  * Not available with FT, FTIC, FTCP, FTCT, or FTCTIC housings	<b>RM</b> Remote Dimming Driver, specify remote power supply in table below	<b>CB27</b> 27" C-Channel Bars  <b>CB32</b> 32" C-Channel Bars  <b>CB52</b> 52" C-Channel Bars  * Residential grade nailer bars provided standard
	<b>Warm Glow Dimming</b> <b>15WG3</b> 15W LED <b>20WG3</b> 20W LED (1)  <b>2722KS</b> 2700K-2200K, 80+ CRI <b>2722KH</b> 2700K-2200K, 90+ CRI <b>3022KS</b> 3000K-2200K, 80+ CRI <b>3022KH</b> 3000K-2200K, 90+ CRI			<b>AC</b> Clear Matte Anodized  <b>WH</b> White <b>BL</b> Black <b>GR</b> Grey <b>BZ</b> Bronze  <b>AB</b> Piano Gloss Black	<b>WH</b> White <b>BL</b> Black <b>GR</b> Grey <b>BZ</b> Bronze  <b>WH</b> White <b>GR</b> Grey <b>BL</b> Black <b>BZ</b> Bronze  <b>RAL</b> Custom Color Specify RAL # *Leave blank for Trimless		* For all of the above leave "____" blank for standard housing) * Add <b>IC</b> to end of housing codes listed above for insulation contact rated version ( <b>15W max for all except NC1C</b> ) * Add <b>CP</b> to end of housing codes listed above for Chicago Plenum rated version ( <b>not available with FTCT</b> )			

USAI  
Power Supply  
Must Be Specified

2. Specify Remote Power Supply

RPB-01					
Remote Power Supply	Wattage Options	Voltage	Remote Dimming Type and Level	Remote Emergency Option	Remote Driver Mounting Accessories*
<b>RPB-01</b> BeveLED Mini Remote Power Supply	<b>Classic White</b> <b>09X3</b> 9W LED <b>15X3</b> 15W LED <b>20X3</b> 20W LED  <b>Warm Glow</b>	<b>UNV</b> 120V - 277V	<b>D4H</b> Lutron H ECO, 1% Fade (1) <b>D4</b> Lutron 3-wire/Eco, 1% (2) <b>D6A</b> EldoLED 0-10V, 0.1% <b>D6B</b> EldoLED 0-10V, 0.1% <b>D6E</b> EldoLED 0-10V, 1% <b>D6F</b> EldoLED 0-10V, 1% <b>D7A</b> EldoLED DALI2, 0.1% <b>D7E</b> EldoLED DALI2, 0.1% <b>D28</b> EldoLED DMX, 0.1%	<b>EM7</b> EM battery requires remote enclosure by others, minimum size 14.5" L x 6.5" W x 3" H (3, 4)	<b>MP</b> Junction Box Mounting Plate, 5-1/8" x 5-1/8"  <b>ENC</b> Single Driver enclosure, 4-1/8" x 9-11/16" x 2-3/8"  * If Remote Driver Mounting Accessories selection is left blank, driver will be provided with accessories for mounting in enclosure by others. See page 7 for remote driver enclosure sizing requirements.
	<b>15WG3</b> 15W LED <b>20WG3</b> 20W LED		<b>120V</b> 120V Only		

1 Not available for Warm Glow. 2 Not available with Classic White. For use with Warm Glow only.  
 3 Not available with MP jbox accessory 4 Not available with ENC single driver enclosure; enclosure by others required.  
 5 Must be specified with ENC single driver enclosure. Not available with EM7



# BeveLED Mini® Complete - B3SW

## 3" Square Wall Wash

### DELIVERED PERFORMANCE

We offer an extremely wide range of wattages, color temperatures, LED color technologies, and beamspreads for this product line, Please refer to tables below and IES files available at [usailighting.com](http://usailighting.com) for exact performance values for the product configuration you choose to specify. All values are reported at 3000K, 80+ CRI, and white trim finish. Use multipliers below to calculate output with other color temperatures, CRIs and finishes.

Color Technology	LED	LUMENS	lm/W	INTENSITY (cd)
Classic White	09X3	669	74	320
	15X3	1044	75	499
	20X3	1424	71	681
Warm Glow Dimming	15WG3	949	63	453
	20WG3	1282	62	612
Color Select Tunable White	12CS1	603	50	292
	18CS1	815	45	395
	15CS2	706	50	323

### CORRELATED COLOR TEMPERATURE MULTIPLIER

Classic White

	2700K			3000K			3500K			4000K		
Color Rendering Index:	80+	90+	95+	80+	90+	95+	80+	90+	95+	80+	90+	95+
Multiplier for Lumen	0.96	0.81	0.70	1.00	0.86	0.74	1.03	0.88	0.79	1.06	0.81	0.81

Warm Glow Dimming

Color Select CS1

Color Select CS2

	2700K				3000K				2200K				2700K				3000K				3500K				4000K				5000K				6000K			
Color Rendering Index:	80+	90+	80+	90+	80+	90+	80+	90+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+	80+						
Multiplier for Lumen	1.00	0.78	1.00	0.83	0.92	0.97	1.00	1.03	1.05	1.10	.13	0.98	1.00	1.06	1.10	1.12	1.13	0.98	1.00	1.06	1.10	1.12	1.13	0.98	1.00	1.06	1.10	1.12	1.13							

### EMERGENCY BATTERY LIGHT OUTPUT MULTIPLIER

0.63 x 15W output values

0.47 x 15W output values

0.47 x 18W output values

### TRIM FINISH MULTIPLIER

Metalized Grey, Conduit Silver, Clear Matte Anodized Bevels: 1.00

Black, Statuary Bronze, Piano Gloss Black Bevels: 0.832

### USAI LIGHTING COLLABORATORY

13 Crosby Street  
New York, NY 10013  
845-234-4090  
[showroom@usailighting.com](mailto:showroom@usailighting.com)

### USAI LIGHTING HEADQUARTERS

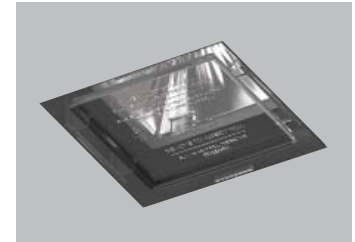
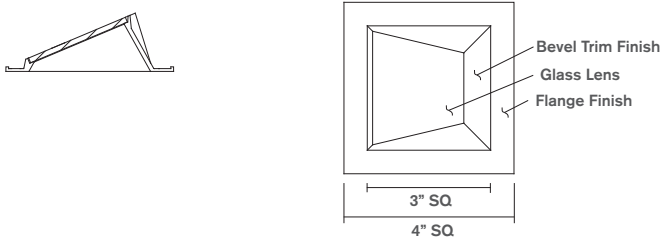
1126 River Road  
New Windsor, NY 12553  
T: 845-565-8500  
[info@usailighting.com](mailto:info@usailighting.com)

# BeveLED Mini® Complete - B3SW 3" Square Wall Wash

## Trimmed - B3SWF

### TRIM DETAILS

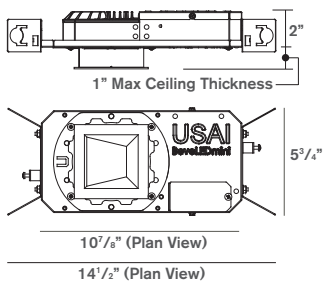
Trimmed - B3SWF



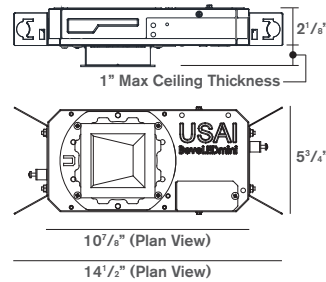
Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

### HOUSING OPTIONS

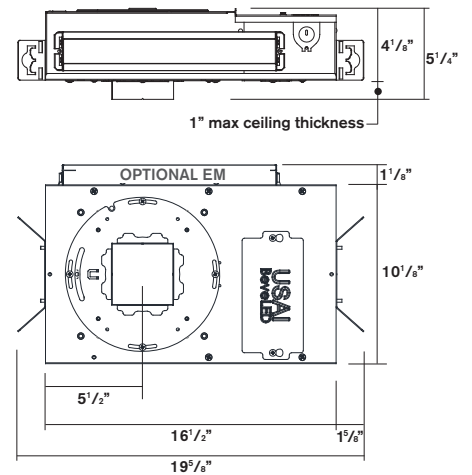
Flat Housing - FT



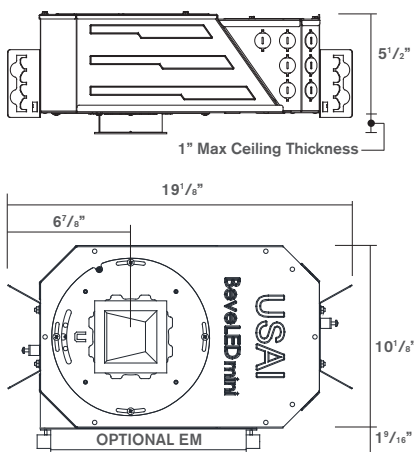
Flat Housing, IC-Rated - FTIC (up to 15W maximum)  
Flat Housing, Chicago Plenum Rated - FTCP



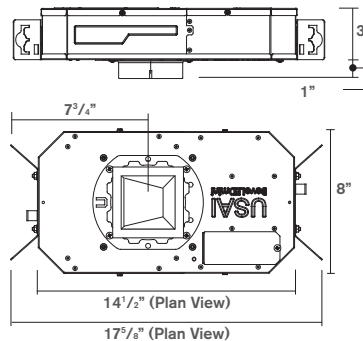
Flat Adjustable Housing - FTA2  
Flat Adjustable Housing, IC-Rated - FTA2IC (up to 15W maximum)  
Flat Adjustable Housing, Chicago Plenum Rated - FTA2CP



New Construction Housing - NC1  
Insulation-Contact Rated - NC1IC  
Chicago Plenum Rated - NC1CP



Flat Housing for Color Technologies - FTCT  
Flat Housing for Color Technologies, Insulation Contact Rated - FTCTIC



\* EM battery requires above ceiling access for service. Not available with FTA2IC or FTA2CP

**NOTE: Aperture plate collar extender accessories available with each housing increase maximum accepted ceiling thickness.**

**-15- accepts 1.5" max ceiling thickness adds 0.5" to overall housing height Available with NC1, NC1IC, NC1CP, FTA2, FTA2IC, and FTA2CP housings only. Not available with FT, FTIC, FTCP, FTCT, or FTCTIC housings.**

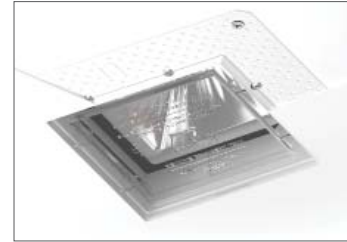
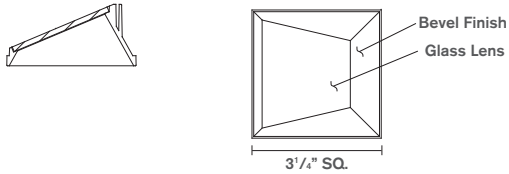
\* EM battery requires above ceiling access for service. Not available with NC1IC or NC1CP

# BeveLED Mini® Complete - B3SW 3" Square Wall Wash

## Trimless - B3SWL

### TRIM DETAILS

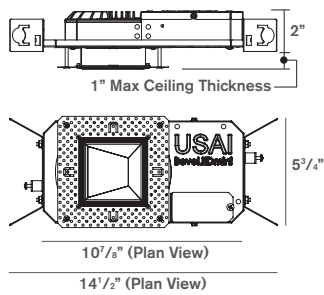
Trimless - B3SWL



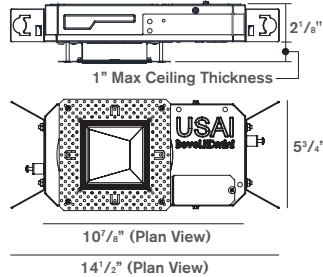
Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

### HOUSING OPTIONS

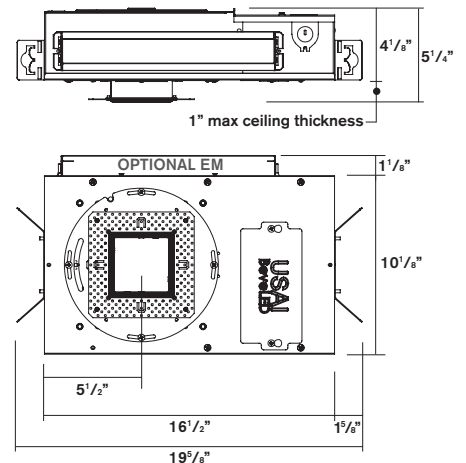
Flat Housing - FT



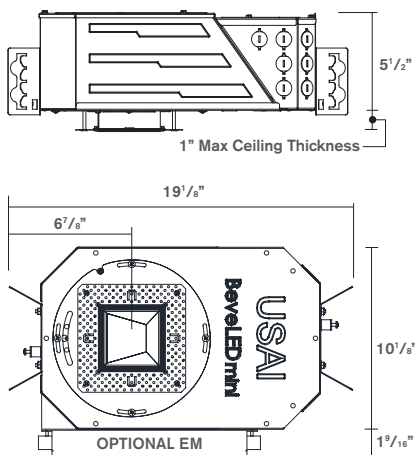
Flat Housing, IC-Rated - FTIC  
(up to 15W maximum)  
Flat Housing, Chicago Plenum Rated - FTCP



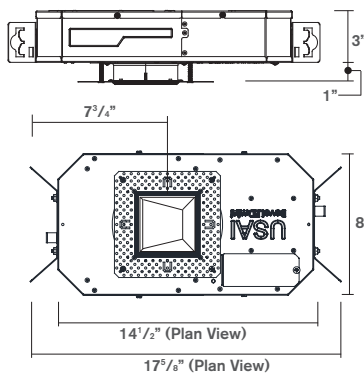
Flat Adjustable Housing - FTA2  
Flat Adjustable Housing, IC-Rated - FTA2IC  
(up to 15W maximum)  
Flat Adjustable Housing, Chicago Plenum  
Rated - FTA2CP



New Construction Housing - NC1  
Insulation-Contact Rated - NC1IC  
Chicago Plenum Rated - NC1CP



Flat Housing for Color Technologies - FTCT  
Flat Housing for Color Technologies,  
Insulation Contact Rated - FTCTIC



\* EM battery requires above ceiling access for service. Not available with FTA2IC or FTA2CP

**NOTE:** Aperture plate collar extender accessories available with each housing increase maximum accepted ceiling thickness.

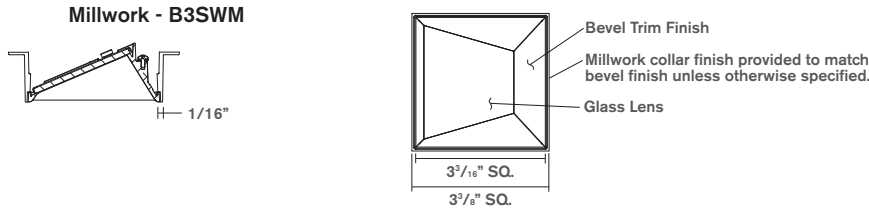
-15- accepts 1.5" max ceiling thickness adds 0.5" to overall housing height Available with NC1, NC1IC, NC1CP, FTA2, FTA2IC, and FTA2CP housings only. Not available with FT, FTIC, FTCP, FTCT, or FTCTIC housings.

\* EM battery requires above ceiling access for service. Not available with NC1IC or NC1CP

# BeveLED Mini® Complete - B3SW 3" Square Wall Wash

## Millwork - B3SWM

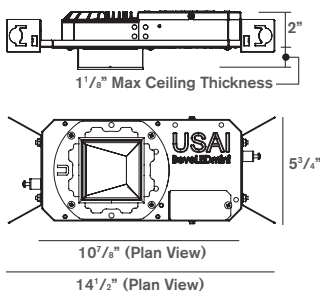
### TRIM DETAILS



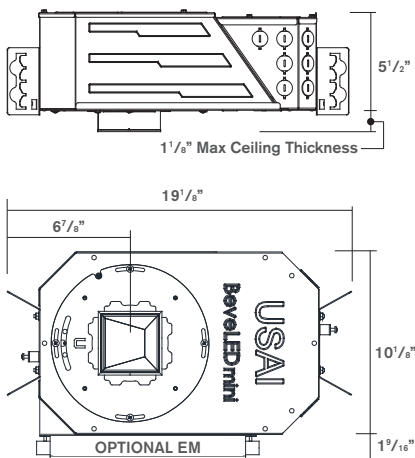
Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

### HOUSING OPTIONS

#### Flat Housing - FT

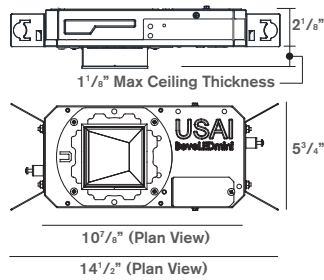


#### New Construction Housing - NC1 Insulation-Contact Rated - NC1IC Chicago Plenum Rated - NC1CP

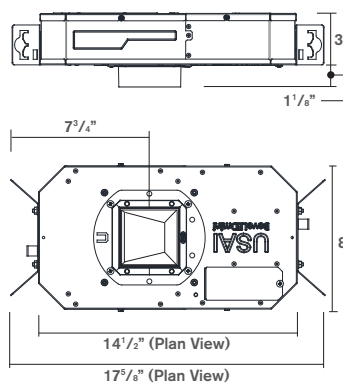


\* EM battery requires above ceiling access for service. Not available with NC1IC or NC1CP

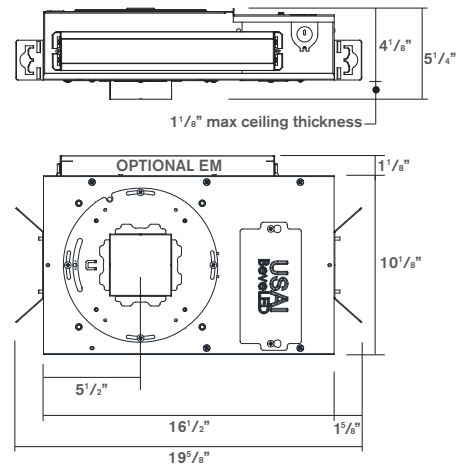
#### Flat Housing, IC-Rated - FTIC (up to 15W maximum) Flat Housing, Chicago Plenum Rated - FTCP



#### Flat Housing for Color Technologies - FTCT Flat Housing for Color Technologies, Insulation Contact Rated - FTCTIC



#### Flat Adjustable Housing - FTA2 Flat Adjustable Housing, IC-Rated - FTA2IC (up to 15W maximum) Flat Adjustable Housing, Chicago Plenum Rated - FTA2CP



\* EM battery requires above ceiling access for service. Not available with FTA2IC or FTA2CP

**NOTE:** Aperture plate collar extender accessories available with each housing increase maximum accepted ceiling thickness.

-15-  
accepts 1-5/8" max ceiling thickness  
adds 0.5" to overall housing height  
Available with NC1, NC1IC, NC1CP, FTA2, FTA2IC, and FTA2CP housings only. Not available with FT, FTIC, FTCP, FTCT, or FTCTIC housings.

# BeveLED Mini® Complete - B3SW

## 3" Square Wall Wash

### BEVELED MINI SPECIFICATIONS

#### FIELD REPLACEABLE LED LIGHT ENGINE

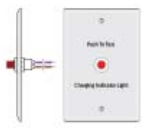
is serviceable through the aperture with a Phillips screwdriver. All USAI Lighting light engines feature industry-leading color consistency.

#### FIELD REPLACEABLE INTEGRAL DRIVER

Unless otherwise specified, a 0-10V, 100%-1% solid state electronic constant current integral dimming driver with a high power factor is provided standard and sources 2mA. All integral dimming drivers are located within the fixture housing and are serviceable from below the ceiling through the aperture. Some on-time delay may be experienced depending on control system used. All dimming drivers comply with IEEE C62.41 surge protection.

#### INTEGRAL EMERGENCY BATTERY

An integral emergency battery pack is available as an option with the NC1 or FTA2 housing and integral driver/power supply only. IOTA emergency battery provides backup power for 90 minutes. EM fixtures are provided with an integral emergency battery that requires above ceiling access for service, and a remote test switch, which comes with a 24" lead length for location of the test switch. Remote EM test switch is dry/damp only; select EMW emergency option for a wet location-rated EM test switch. Fixtures that have no USAI EM option may be connected to an inverter (by others) for emergency lighting.



**Remote Emergency Test Switch included with NC1 or FTA2 housing and integral driver only. Above ceiling access required for service.**

#### REMOTE LOCATION DRIVER

BeveLED Mini is available for use with remotely located driver. Driver is provided separately for remote location on site, and requires an enclosure to be provided by USAI or by others that meets local codes. Enclosure must be located in an accessible service panel within 100ft of the light fixture; see remote driver table below for coordination of enclosure sizes and wire gauges required. All dimming drivers comply with IEEE C62.41 surge protection.

Remote Power Supply Requirements and Wiring Diagram enclosure sizes and wire gauge with **1 fixture** per power supply.

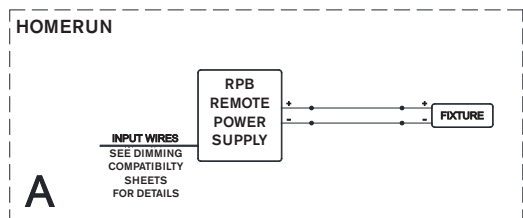
Remote Power Supply Dimming Option		Wire Gauge Required*	Minimum Enclosure Size Required (by others)	
			RP Only	RP with EM Option**
<b>UNV-D4H</b>	Lutron H ECO, 1% fade (1)	14/12	6.25" W x 4" L x 2" H	14.5" W x 6.5" L x 3" H
<b>UNV-D4</b>	Lutron 3-wire/Eco, 1% (2)			
<b>UNV-D6A</b>	EldoLED 0-10V, 0.1%	18/16		
<b>UNV-D6B</b>	EldoLED 0-10V, 0.1%			
<b>UNV-D6E</b>	EldoLED 0-10V, 1%			
<b>UNV-D6F</b>	EldoLED 0-10V, 1%			
<b>UNV-D7A</b>	EldoLED DALI2, 0.1%			
<b>UNV-D7E</b>	EldoLED DALI2, 1%			
<b>UNV-D28</b>	EldoLED DMX, 0.1%			
<b>120V-D19</b>	Hatch 2-wire phase, 1% (1)	14/12		
<b>120V-D22</b>	ERP 2-wire phase, 1%	18/16	5.75" W X 2.625" L x 2" H	N/A

1 Not available for Warm Glow  
2 Not available with Classic White. Warm Glow only.

**Not all dimming options are available with all LED light engine options. See RP ordering table for details.**

\* Wire gauge 14/12 = Maximum distance from light fixture to remote power supply is 100' using 12 gauge wire, 50' using 14 gauge wire.  
\* Wire gauge 18/16 = Maximum distance from light fixture to remote power supply is 100' using 16 gauge wire, 50' using 18 gauge wire.  
\*\* Emergency battery remote power supplies cannot be located any more than 50 feet from light fixture.

Note: All light fixtures must be wired in homeruns per wiring diagram below.



# BeveLED Mini® Complete - B3SW

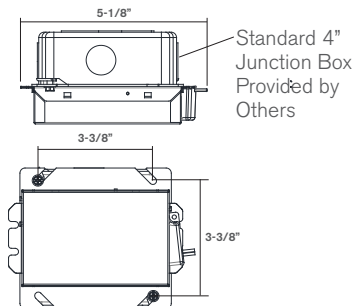
## 3" Square Wall Wash

### BEVELED MINI SPECIFICATIONS

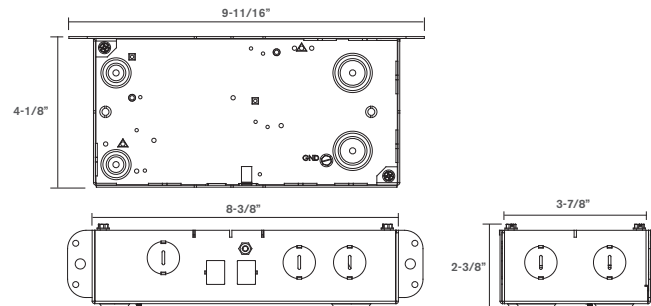
#### ENCLOSURES FOR REMOTE DRIVERS

Remote drivers require enclosures per local code. Enclosures can be provided by others, or for convenience, USAI can provide them to you. The choices available depend on the dimming driver specified. In the case of the metal encased drivers, USAI can offer a metal mounting plate sized 5-1/8" x 5-1/8" which attaches to the back of each dimming driver and can be installed directly inside a standard 4" square junction box. For the other dimming drivers we offer, USAI can provide an enclosure sized 4-1/8" wide x 9-11/16" long x 2-3/8" deep to accommodate one dimming driver each. Please refer to remote dimming driver ordering tables for clarification on which driver installation accessories, mounting plate or enclosure, are available for each remote dimming driver option. When choosing to use USAI remote dimming driver mounting accessories, whether enclosures or mounting plates, specify the accessory in the accessories column of the remote dimming driver ordering table to indicate selection. Field wiring should be according to NEC code; per article 411.7. EC is responsible for adherence to all local codes. Refer to remote dimming driver tables for maximum distances, locations, and wire gauges required, which varies by driver type.

#### MP JUNCTION BOX MOUNTING PLATE



#### ENC SINGLE DRIVER ENCLOSURE



#### ADJUSTMENT

362° horizontal locking in 90° increments.

#### HOUSING

All BeveLED Mini fixtures are field-flexible which allows for field changes from trimless or millwork to trimmed with a simple components change with parts from USAI. All-Ways Square® (covered by US Pat. No: US 7,832,889) feature available on NC1, NC1IC and NC1CP housings allows alignment of square aperture (up to 20° rotation) after housing installation and prior to finish ceiling installation. Housings are fabricated of 20 ga. steel construction with thru wire J-box, 4 in 4 out at min. 90°C, #12 AWG thru branch circuit wiring. FTIC and NC1IC housing for use with 9W, 12W and 15W light engines only are rated for direct contact with spray foam insulation of R-42 or less. FTIC and FTA2IC housings are IC-rated up to 15W maximum.

#### MOUNTING

B3SWF overlap flange fixtures are designed for use in sheetrock, acoustical ceiling tile, and many other ceiling materials. B3SWL trimless fixtures are provided with a spackle collar and are designed for use in sheetrock/mud-in ceiling applications. B3SWM millwork fixtures are provided with a millwork collar and are designed for use in wood/millwork and stone construction applications. Butterfly brackets and residential grade adjustable nailer bars extendible from 14" to 24" centers with integral nails are provided standard for attachment to building structure. C-channel bars are optionally available for acoustical ceiling applications.

#### COLLAR EXTENSION FOR THICK CEILINGS

All USAI BeveLED Mini housings can accept up to 1" thick ceilings standard. Collar extenders are available to specify with each housing allowing a maximum of up to 1.5" thick ceilings maximum. Aperture collar extenders increase overall height of each housing and may result in a reduction in light output; see housing drawings for more details.

#### FIXTURE WEIGHT

FT, FTIC, and FTCP housings weigh 4 lbs. FTA2, FTA2IC, FTA2CP, FTCT, and FTCTIC housings weigh 10 lbs. NC1, NC1IC, and NC1CP housings weigh 11 lbs. FTA2 housing with EM weighs 13 lbs and NC1 housing with EM weighs 14 lbs.

#### WARRANTY

Based on IESNA LM80-2008, BeveLED has a 50,000 hour rated life at 70% lumen maintenance (L70). USAI Lighting Warranty covers replacement parts for 5 years from date of shipment. Ambient temperatures at fixture location should not exceed 40°C during normal operation.

#### CEILING CUT OUT

B3SWF Trimmed with Overlap Flange: 3-1/2" x 3-1/2"

B3SWL Trimless Spackle-in: 4-1/16" x 4-1/16"

B3SWM Millwork Knife-edge: 3-3/8" x 3-3/8"

#### TRIM FINISH

BeveLED Mini trims are available in a wide range of finishes. USAI's standard powdercoat painted trim finishes are white, conduit silver, gray, black, and bronze. A clear matte anodized bevel and piano gloss black electrocoated bevel are also available with matching or contrast-painted flange finish options. Anti-microbial painted finish available in white. Natatorium finishes are triple-coated for corrosion resistance; these coatings are offered in painted finishes only and are not available for trimless or millwork. All trim finishes are dry/damp/wet location rated, with the exception of the anodized (-AC-) and electrocoated (-AB-) bevel finishes, which are dry/damp only. Please contact the USAI factory with a RAL number specification for custom color trims, or specify the field-paintable primer finish option.

# BeveLED Mini® Complete - B3SW

## 3" Square Wall Wash

### BEVELED MINI SPECIFICATIONS

#### LISTINGS

Dry/Damp/Wet location. Rated for use in steam rooms and saunas, up to 15W maximum; 18W and/or 20W are not for use in steam rooms or saunas. AC and AB trim finishes are dry/damp only. FTIC, FTCP, FTA2IC, FTA2CP, FTCT, FTCTIC, NC1, NC1IC and NC1CP housings are Airtight. EM test switch is dry/damp only. Select EMW option for wet location remote test switch. UL2043 rated for use in air handling plenums. NRTL/CSA-US tested to UL standards. IBEW union made. All USAI Lighting products are Buy American Act (BAA) compliant.



#### NOTES

- Not for use in corrosive environment
- Use of pressure washer voids warranty

#### PHOTOMETRICS

Consult factory or website for IES files. Tested in accordance with IESNA LM79.



# BeveLED Mini® Complete - B3SW 3" Square Wall Wash

## LED COLOR OPTIONS

### Classic White Light

Our proprietary LED light engines achieve a 2-step MacAdam ellipse along the black body locus, resulting in reliable and uniform color from fixture to fixture. You'll see the results in consistently beautiful light throughout your space, whichever USAI LED product you specify.



### Warm Glow® Dimming

Warm Glow Dimming provides warmth and glow once possible only in dimmed incandescent sources. Utilizing our patented proprietary algorithm and circuitry, Warm Glow Dimming technologies precisely mimic the black body curve of a standard 100W A19 lamp by gradually transitioning from 2700K or 3000K down to 2200K. The result is virtually indistinguishable from an incandescent light source.



### Color Select® Tunable White

Color Select represents the next innovation in color temperature control for advanced LED recessed downlighting. Color Select® products allow users to adjust color temperature from 6000K down to 2200K while independently adjusting intensity to achieve ultimate control over the quality of light in a space with a single fixture type. Color Select interfaces with standard dimming and control systems.







## FEATURES & SPECIFICATIONS

**INTENDED USE** — Ideal for applications requiring attractive, thin-profile, die-cast aluminum signage.

**CONSTRUCTION** — Die-cast aluminum housing, thin profile. Clear lacquer, brushed aluminum inhibits fingerprints and other surface contaminants. Also available with white finish.

Universal directional chevron knockouts are completely concealed and easily removed.

Letters are 6" high with 3/4" stroke, with 100 ft. viewing distance rating, based upon UL924 standards.

**OPTICS** — The typical life of the exit LED lamp is 10 years.

Low energy consumption: one watt (120/277V).

**ELECTRICAL** — Dual-voltage input capability 120 or 277 VAC. Emergency models are provided with test switch, status indicator and a battery that automatically recharges when normal power is restored.

Battery: Emergency model provided with sealed, maintenance-free, nickel-cadmium battery that delivers 90 minutes of emergency power.

**INSTALLATION** — Universal mounting (top, end or back). Mounting knockouts and hole plugs are easily removed. Die-cast aluminum canopy is provided.

**LISTINGS** — UL Listed standard. Damp location listing 32°F to 122°F (0°C to 50°C) standard. Meets UL 924, NFPA 101 (current Life Safety Code), NFPA 70-NEC and OSHA illumination standards.

**WARRANTY** — 5-year limited warranty. This is the only warranty provided and no other statements in this specification sheet create any warranty of any kind. All other express and implied warranties are disclaimed. Complete warranty terms located at [www.acuitybrands.com/support/warranty/terms-and-conditions](http://www.acuitybrands.com/support/warranty/terms-and-conditions)

**Note:** Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

† Exit Signs Certified in the CA Title 20 Appliance Efficiency Database.

Catalog Number
Notes
Type

Thin Die-Cast Aluminum Exit



# TLE

LED Lamps



### ORDERING INFORMATION

All configurations of this product are considered "standard" and have short lead times.

**Example:** TLE 1 R EL N

TLE Family	Housing color	Number of faces	Letter color	Operation
TLE	(blank) Brushed aluminum	1 Single face	R Red	(blank) AC only; 120/277V
	W White	2 Double face	G Green	EL N 120/277 VAC input with nickel-cadmium battery back-up

<b>Accessories:</b> Order as separate catalog number.	
ELA WG1	Back-mount wireguard <sup>1</sup>

**Notes**  
1 See spec sheet [ELA-WG](#).

## SPECIFICATIONS

### ELECTRICAL

Primary Circuit				
Type	Typical LED life	Supply voltage	Input watts	Max. amps
Red LED, AC only	10 years	120	1	0.1
		277	1	0.1
Green LED, AC only	10 years	120	1	0.1
		277	1	0.1
Red LED, emergency	10 years	120	1	0.1
		277	1	0.1
Green LED, emergency	10 years	120	1	0.1
		277	1	0.1

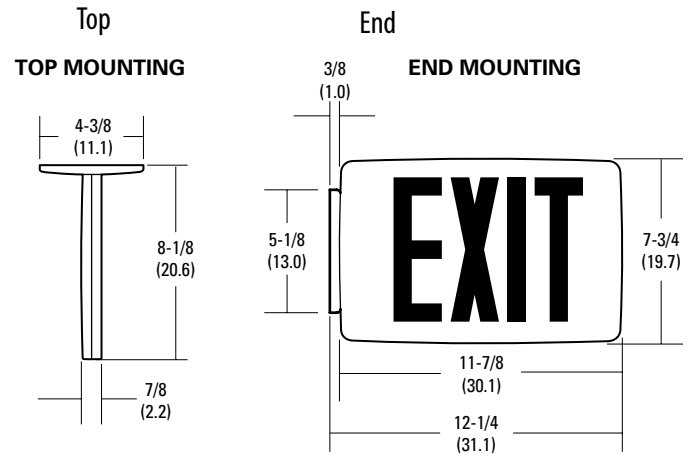
BATTERY (EL N option)			
Sealed Nickel-Cadmium, 2.4V			
Shelf life <sup>2</sup>	Typical life <sup>3</sup>	Maintenance <sup>3</sup>	Temperature range <sup>4</sup>
3 years	6-8 years	None	32° - 122°F (0° - 50°C)

### Notes

- 1 Based on continuous operation. The typical life of the exit LED lamp is 10 years.
- 2 At 77°F (25°C).
- 3 All life safety equipment, including emergency lighting path of egress, must be maintained, serviced and tested in accordance with all National Fire Protection Association and local codes. Failure to perform the required maintenance, service or testing could jeopardize the safety of occupants and will void all warranties.
- 4 Temperature range where unit will provide capacity for 90 minutes. Higher and lower temperatures affect life and capacity.

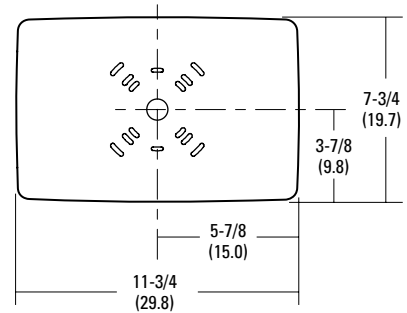
## MOUNTING

All dimensions are inches (centimeters).  
Shipping weight: 3 lbs. (1.3 kgs.).



### Backplate

#### BACK MOUNTING





EM

Catalog Number
Notes
Type

Contractor Select™

# ELM4L

## Quantum® Contemporary Commercial LED Emergency Light



The Lithonia Lighting® Quantum® ELM4L Emergency Light is suitable for emergency lighting applications such as stairways and hallways. Its high performance LED lamp heads makes the ELM4L ideal for safely illuminating the path of egress for applications requiring attractive LED unit equipment with quick installation and unparalleled performance for 7.5' to 24' mounting heights. It can be wall or ceiling mounted and will provide 90 minutes of emergency power in the case of power loss.

**FEATURES:**

- Test switch and status indicator
- UL indoor damp location 50°F to 104°F (10°C to 40°C) listed standard
- For use with 120-277VAC input

† Small Battery Chargers Certified in the CA Title 20 Appliance Efficiency Database.



Catalog Number	UPC	Description	Supply Voltage	Input Wattage		Input Amps		Pallet Qty
				120	277	120	277	
ELM4L	191723916287	Quantum® LED Adjustable Optics 640 Lumens, 6.6W, Emergency Light, White housing	120-277VAC, 50/60Hz	3.15	3.15	0.032	0.032	432

<b>Accessories:</b> Order as separate catalog number.	
ELA WG1	Wireguard 15-1/4" W x 13-3/4" H x 6" D (back mount only). See spec sheet <a href="#">ELA-WG</a> .
WPVS LRG W	Wet protective vandal shield (must be used for wet location applications)



## Specifications

### INTENDED USE:

Provides a minimum of 90 minutes illumination for the rated wattage upon loss of AC power to meet and exceed code required emergency lighting. Ideal for applications requiring attractive LED unit equipment with quick installation and unparalleled performance for mounting heights from 7.5' TO 30'.

### CONSTRUCTION:

The housing is a standard white thermoplastic with a compact and low-profile contemporary design. It is 5VA flame rated, impact-resistant, scratch-resistant and corrosion proof. The UV-stable resin resists discoloration from natural and man-made light sources. The back-plate contains a universal j-box mounting pattern to facilitate ease of installation on a wide variety of j-boxes and the front housing allows tool-less access for ease of maintenance.

### OPTICS:

The typical life of the LED is 10 years. Two 3.3W LED Lamps.

### ELECTRICAL:

Multi-voltage 120-277, 50/60hz standard. Emergency unit provided with test switch, status indicator and rechargeable battery. Sealed, maintenance-free nickel-cadmium battery provides 90 minutes of emergency power.

### INSTALLATION:

Wall and ceiling mount. Tool-less removal of front cover from back-plate for ease of installation and maintenance.

### LISTINGS:

UL damp location listed standard and wet location listed when used with the WPVS accessory, all at 50-104°F (10-40°C). Meets or exceeds all applicable requirements for UL 924, NFPA 101 (current Life Safety Code), NFPA 70 (NEC), NOM (Norma Oficial Mexicana), California Energy Commission Title 20 section 1605.3 (W)(4), FCC Title 47, Part 15, Subpart B and OSHA. List and labeled to comply with Canadian Standards C22.2 No. 141-10.

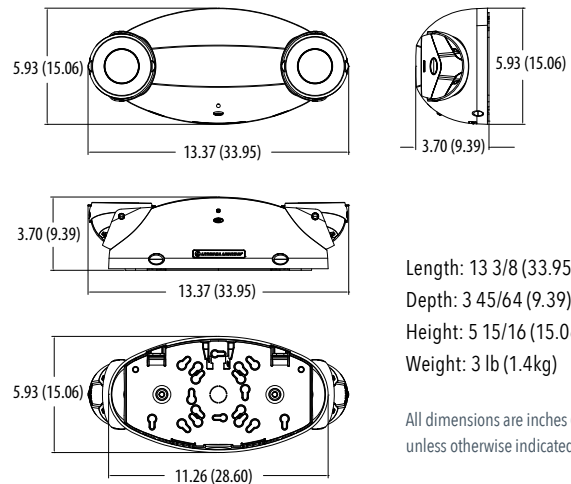
### WARRANTY:

5-year limited warranty. Complete warranty terms located at:

[www.acuitybrands.com/support/customer-support/terms-and-conditions](http://www.acuitybrands.com/support/customer-support/terms-and-conditions)

**Note:** Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

## Dimensions





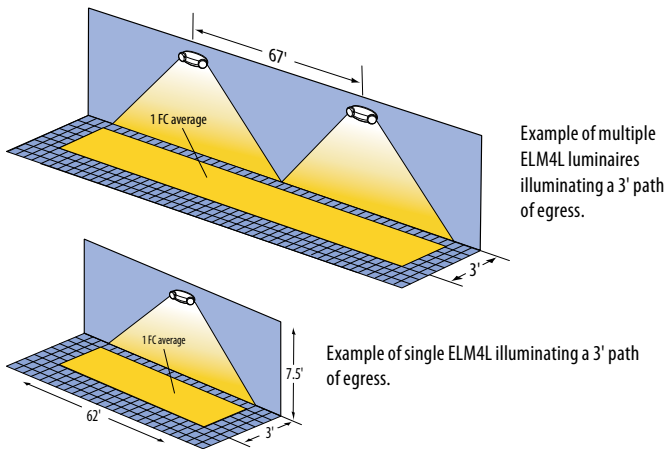
## Spacing guidelines

Maximum Spacing Guidelines — ELM4L <sup>1</sup>						
Mounting Height	Illumination Level	Single Luminaire		Multiple Luminaire		Application Notes
		3' Path of Egress	6' Path of Egress	3' Path of Egress	6' Path of Egress	
7.5'	1FC Avg <sup>1</sup>	62'	58'	67'	60'	100' Corridor, 8' wide, and 12' high with 80/50/20 reflectances
10'	1FC Avg <sup>1</sup>	62'	58'	67'	60'	
7.5'	1FC Avg <sup>1</sup>	52'	40'	66'	58'	Retail open area: 200' X 15' X 30' with 80/50/20 reflectances
10'	1FC Avg <sup>1</sup>	52'	48'	64'	60'	
12'	1FC Avg <sup>1</sup>	52'	48'	62'	59'	
16'	1FC Avg <sup>1</sup>	52'	44'	61'	58'	
20'	1FC Avg <sup>1</sup>	44'	42'	60'	58'	
24'	1FC Avg <sup>1</sup>	34'	34'	42'	58'	

**Notes:**

1. Also meets the additional illumination requirements of NFPA 101: 1FC minimum and max/min ration of 40:1.

\*Note: To see complete photometric report or download the .ies file for this product, visit Lithonia Lighting ELM4L and ELM6L home page.





# Fiori™ EXA

CEILING / SCNCE / OUTDOOR





**FEATURES**

- EXCELLENT THERMAL MANAGEMENT IS ACHIEVED THROUGH AN EXTRUDED AND MACHINED ALUMINUM FIXTURE BODY
- 45° CUTOFF AND STEPPED BEZEL MINIMIZES GLARE AND INCREASES VISUAL COMFORT
- NUMEROUS SECONDARY LENS OPTIONS AVAILABLE
- VARYING BEAM SPREAD OPTIONS ARE AVAILABLE: NARROW FLOOD [24 DEGREE] OR WIDE FLOOD [50 DEGREE]
- 3 STEP LED BINNING



**CATALOG CODES**

A	B	C	D	E	F	UNV	H	I
SERIES	HANGING SYSTEM	SIZE	REFLECTOR	FINISH	LIGHT SOURCE	VOLTAGE	CONTROL	OPTIONS

SPECIFY CATALOG CODE				
A	B	C	D	E
SERIES	H	SIZE	REFLECTOR	FINISH
 FR2   FR3   FR4	<b>C1NA</b> INDOOR SURFACE CEILING MOUNT	<b>08</b>	<b>NF</b> NARROW FLOOD [24 DEGREE]	<b>POWDER COAT FINISHES</b> <b>BKP</b> BLACK <b>BMP</b> BRASS METALLIC <b>BNP</b> BRONZE <b>BTP</b> BLACK TEXTURED <b>GRP</b> GRAPHITE <b>GLP</b> GOLDTASTIC <b>MWP</b> MATTE WHITE <b>SGP</b> STEEL GRAY <b>SMP</b> SILVER METALLIC <b>SWP</b> SKY WHITE <b>WTP</b> WHITE TEXTURED
	<b>S1SC</b> INDOOR SCNCE		<b>WF</b> WIDE FLOOD [50 DEGREE]	
	<b>010B</b> OUTDOOR SCNCE (ETL LISTED FOR WET LOCATION)			
 FR1		<b>13</b> (FR1 ONLY)		

F LIGHT SOURCE		G VOLTAGE	H CONTROL	I OPTIONS
8"		<b>UNV</b> 120-277	<b>DM0</b> 0-10V DIMMING 10% (FR1 WITH 2LED1 ONLY) <b>DM1</b> 0-10V DIMMING 1% (NOT AVAILABLE IN 2LED1) <b>DM3</b> LUTRON HI-LUME ECOSYSTEM 1% (LDE1); FR1 ONLY, NOT AVAILABLE IN 2LED1	<b>ULD</b> DAMP LABEL (C1NA & S1SC ONLY) <b>BIOS</b> BIOS SKYBLUE™ OR BIOS SKYBLUE™ DYNAMIC LIGHT ENGINE* <b>HCL</b> HEX CELL LOUVER <b>SFL</b> SOFTENING LENS <b>SPL</b> SPREAD LENS <b>LSL</b> LINEAR SPREAD LENS <b>MOD</b> MODIFIED LUMINAIRE (CONTACT LOCAL REP)
<b>LED OUTPUT LED1</b>	<b>COLOR TEMP</b>			
	27K 30K 35K 40K			
13"				
<b>LED1</b>	<b>27K</b>			
<b>LED2</b>	<b>30K</b>			
<b>LED3</b>	<b>35K</b>			
<b>2LED1*</b>	<b>40K</b>			
<b>FR1 WITH S1SC OR 010B ONLY</b>				

UP TO **93** LM/W

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp.

\*2LED1 is up/down illumination. LED1, LED2, & LED3 are same direction.

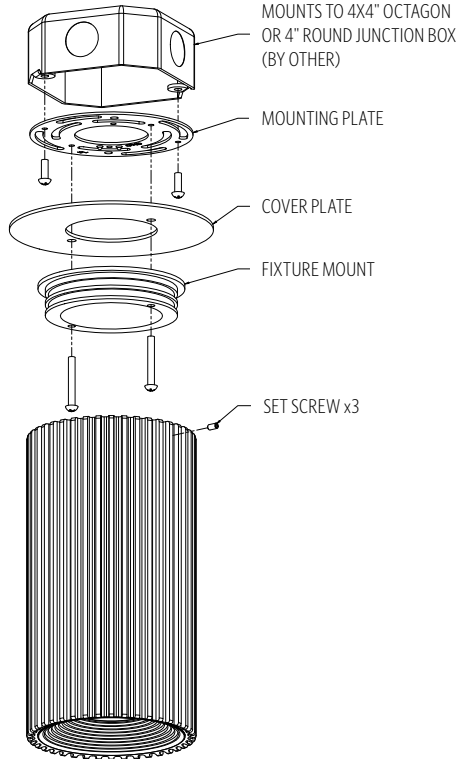
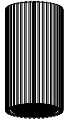
LUMENS AND WATTAGE CHART			
		8"	13"
<b>LED1</b>	LUMENS DELIVERED	1500	1500
	SYSTEM WATTAGE	16	16
<b>LED2</b>	LUMENS DELIVERED	NA	2135
	SYSTEM WATTAGE	NA	26
<b>LED3</b>	LUMENS DELIVERED	NA	2855
	SYSTEM WATTAGE	NA	37
<b>2LED1*</b>	LUMENS DELIVERED	NA	2750
	SYSTEM WATTAGE	NA	32

**SAMPLE CODE: FR2-S1SC-08-WF-BTP-LED1/35K-UNV-DM1-HCL**

\*Contact factory for BIOS SkyBlue® or BIOS SkyBlue® Dynamic light engine and control options.

## HANGING SYSTEM

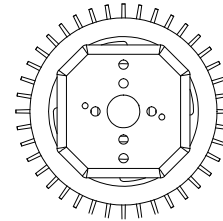
### C1NA INDOOR SURFACE CEILING MOUNT



#### MOUNTING INFORMATION CHART

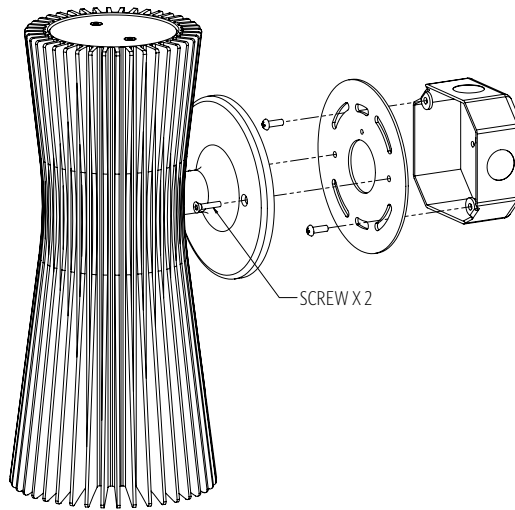
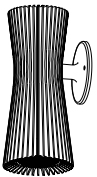
LUMINAIRE HEIGHT	LUMINAIRE WEIGHT	MOUNTING POINTS
8"	6 LBS	1
13"	9 LBS	1

Fixture is provided with 5" dia. cover plate finished to match the fixture body; if no visible cover plate is desired, a 3" mud ring should be pre-installed (supplied by others); 5" dia. cover plate can be discarded if unused.



MOUNTS TO 4X4" OCTAGON OR 4" ROUND JUNCTION BOX (BY OTHER)

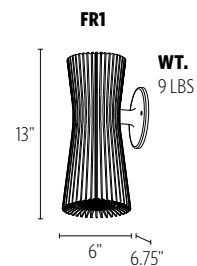
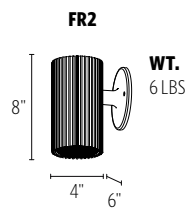
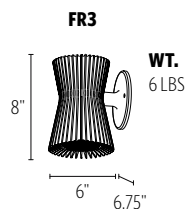
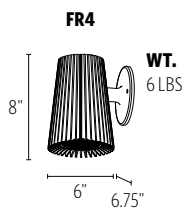
### S1SC INDOOR SCONCE O10B OUTDOOR SCONCE (ETL LISTED FOR WET LOCATION)



#### MOUNTING INFORMATION CHART

LUMINAIRE HEIGHT	LUMINAIRE WEIGHT	MOUNTING POINTS
8"	6 LBS	1
13"	9 LBS	1

## SIZES



## FINISH

### METALLIC POWDER COAT FINISHES:



### SOLID POWDER COAT FINISHES:



### TEXTURED POWDER COAT FINISHES:



**RAL®, Pantone®, or custom finishes are also available.**

These colors are for reference only. Please be aware that colors may vary per monitor. Contact your local rep for finish samples or with any questions.

## LIGHT SOURCE

LUMENS AND WATTAGE CHART		8"    13"	
		<b>LED1</b>	LUMENS DELIVERED
	SYSTEM WATTAGE	16	16
<b>LED2</b>	LUMENS DELIVERED	NA	2135
	SYSTEM WATTAGE	NA	26
<b>LED3</b>	LUMENS DELIVERED	NA	2855
	SYSTEM WATTAGE	NA	37
<b>2LED1*</b>	LUMENS DELIVERED	NA	2750
	SYSTEM WATTAGE	NA	32

STANDARD COLOR TEMPERATURE OPTIONS	CRI (RA)
2700K	80+
3000K	80+
3500K	80+
4000K	80+

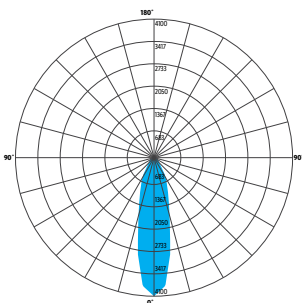
### PHOTOMETRY:

FIXTURE: FRI-P1CB-13-NF-PTD-1LD15/35K-120  
 COLOR TEMP #: 3500K  
 OUTPUT: 1500  
 EFFICACY: 93 LM/W  
 TEST REPORT: TEST NO. 18332.0

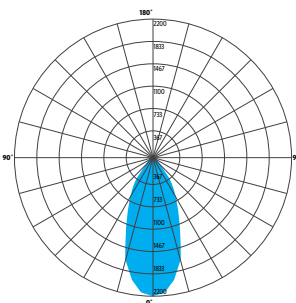
For all available IES files, please visit our website at [ocl.com](http://ocl.com).

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp.  
 \*2LED1 is up/down illumination. LED1, LED2, & LED3 are same direction.

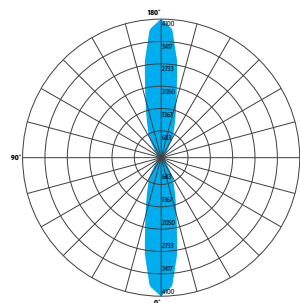
ZONE	NARROW FLOOD		WIDE FLOOD		NARROW FLOOD UP/DOWN (2LED1)		WIDE FLOOD UP/DOWN (2LED1)	
	LUMENS	% OF LUMINAIRE	LUMENS	% OF LUMINAIRE	LUMENS	% OF LUMINAIRE	LUMENS	% OF LUMINAIRE
0-30	1187	81%	1112	74%	1187	40%	1112	37%
0-60	1468	99.7%	1499	100%	1468	49%	1499	50%
0-90	1472	100%	1499	100%	1472	50%	1499	50%
0-120	-	-	-	-	2374	80%	2224	74%
0-150	-	-	-	-	2936	99%	2998	100%
0-180	-	-	-	-	2944	100%	2998	100%



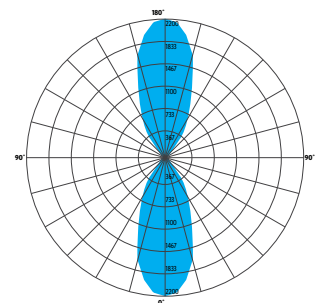
**NARROW FLOOD**



**WIDE FLOOD**



**NARROW FLOOD UP & DOWN (2LED1)**



**WIDE FLOOD UP & DOWN (2LED1)**



## CONTROL

### DMO 0-10V DIMMING DOWN TO 10% (FR1 WITH 2LED1 ONLY)

- 0-10V DIMMING
- 10% MINIMUM DIM LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MIN AMBIENT OPERATING TEMPERATURE -31°F
- FIELD REPLACEABLE

### DM1 0-10V DIMMING DOWN TO 1%

- 0-10V DIMMING
- 1% MINIMUM DIMMING LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MIN AMBIENT OPERATING TEMPERATURE = -31°F
- FIELD REPLACEABLE

### DM3 LUTRON HI-LUME ECOSYSTEM 1% (LDE1; FR1 ONLY)

- LUTRON DIGITAL ECOSYSTEM DIMMING
- 1% MINIMUM DIMMING LEVEL
- SOFT-ON / FADE-TO-BLACK
- ELECTRONIC DRIVER
- POWER FACTOR >0.9 @ 120V
- THD <23% @ 120V
- MIN AMBIENT OPERATING TEMPERATURE = 32°F
- FIELD REPLACEABLE

## OPTIONS

### ULD DAMP LABEL LUMINAIRE

- MAY BE USED IN AN OUTDOOR AREA THAT IS PROTECTED FROM DIRECT CONTACT WITH WIND, RAIN, SNOW OR EXCESSIVE MOISTURE

### HCL HEX CELL LOUVER

- PROVIDES A 45° VISUAL CUT-OFF TO HELP REDUCE GLARE

### SFL SOFTENING LENS

- TEXTURED LENS THAT SOFTENS AND SPREADS BEAM

### SPL SPREAD LENS

- DIRECTS THE LAMP BEAM TO CREATE A DIFFUSED SPREAD IN AN EVEN PATTERN IN ALL DIRECTIONS

### LSL LINEAR SPREAD LENS

- PRODUCES ASYMMETRICAL LIGHT DISTRIBUTION, CREATING AN OVAL OF LIGHT

### MOD MODIFIED LUMINAIRE

- LUMINAIRE IS MODIFIED FROM STANDARD OPTIONS; CONTACT LOCAL REP FOR MORE INFORMATION

## SPECIFICATIONS

### CONSTRUCTION

- FIXTURE IS EXTRUDED AND MACHINED ALUMINUM
- HARDWARE IS ZINC PLATED OR STAINLESS STEEL

### LENSING

- STANDARD LENS INCLUDED FOR 2LED1 ONLY
- FOR SISA IN UPWARD FACING ORIENTATION, NOTE IN MODIFICATIONS AND A LENS WILL BE PROVIDED

### ELECTRICAL

- DIMMING ELECTRONIC DRIVER(S), COMES STANDARD WITH 0-10V DOWN TO 10%
- 0-10V DOWN TO 1% AND LUTRON ECOSYSTEM (LDE1) 1% ALSO AVAILABLE AS MODIFICATION (REQUIRES REMOTE DRIVERS; FR1 ONLY, NOT AVAILABLE IN 2LED1)
- BRIDGELUX COB
- LUMINAIRE CONNECTS TO BUILDING SUPPLY (120V-277V 50/60HZ) UNLESS DRIVERS ARE REMOTE

### LISTING

- SISC & CINA ETL LISTED TO UL 1598 FOR DRY LOCATIONS; ULD DAMP LOCATION LISTED IS OPTION
- O10B ETL LISTED TO UL 1598 FOR WET LOCATION

### WARRANTY

- 5 YEAR; ALL ELECTRICAL COMPONENTS RETAIN THE MANUFACTURER'S WARRANTY

### SUSTAINABILITY

- BIOS LIGHTING CONTRIBUTES TOWARD THE CIRCADIAN LIGHTING DESIGN FEATURE 54 UNDER THE WELL BUILDING STANDARD™ V1 AND FEATURE L03 UNDER THE WELL BUILDING STANDARD V2

## COMMON MODIFICATIONS

### WE'RE BUILT FOR OUT-OF-THE-BOX THINKERS.

Nearly 50% of OCL fixtures we manufacture have some type of modification. Here is a list of common modifications we frequently produce. **Please contact the factory for modifications specific to your fixture or project**

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- BIOS, TUNABLE WHITE, WARM-DIM, & RGBW LIGHT SOURCES
- SPECIFIC LUMEN OUTPUT
- MODIFIED CLUSTERS OR CONFIGURATIONS / MULTI-DROP CANOPIES
- VARIOUS SHAPES, ARCS, AND CURVES FOR LINEAR PROFILES AND RINGS
- CEILING OR SURFACE MOUNTING
- LARGE SCALE MODIFICATIONS
- RAL, PANTONE, BRAND-SPECIFIC, RETIRED OCL COLOR, OR CUSTOM FINISHES



- EMERGENCY BATTERY BACKUP OR INVERTER OPTIONS
- REMOTE DRIVERS / EXTENDED DISTANCE REMOTE DRIVERS
- DIMMING TO 0.1% (DIM TO DARK)
- NON-STANDARD SIZES OR LENGTHS
- NON-STANDARD CANOPY, BODY AND/OR CORD COLORS
- SEISMIC AND/OR ANTI-SWAY SYSTEMS
- RIGID STEMS
- MODIFIED OVERALL HEIGHTS (LONGER OR SHORTER OAH)
- UPLIGHT ADDITIONS
- LASER ETCHING, ENGRAVING, AND CUTOUTS

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# Fiori™ EXAA

CEILING / SCONCE / OUTDOOR





**FEATURES**

- EXCELLENT THERMAL MANAGEMENT IS ACHIEVED THROUGH AN EXTRUDED AND MACHINED ALUMINUM FIXTURE BODY
- 45° CUTOFF AND STEPPED BEZEL MINIMIZES GLARE AND INCREASES VISUAL COMFORT
- NUMEROUS SECONDARY LENS OPTIONS AVAILABLE
- VARYING BEAM SPREAD OPTIONS ARE AVAILABLE: NARROW FLOOD [24 DEGREE] OR WIDE FLOOD [50 DEGREE]
- 3 STEP LED BINNING



**CATALOG CODES**

A	B	C	D	E	F	UNV	H	I
SERIES	HANGING SYSTEM	SIZE	REFLECTOR	FINISH	LIGHT SOURCE	VOLTAGE	CONTROL	OPTIONS

SPECIFY CATALOG CODE					
A	B	C	D	E	
SERIES	H	SIZE	REFLECTOR	FINISH	
 FR2   FR3   FR4	<b>C1NA</b> INDOOR SURFACE CEILING MOUNT	<b>08</b>	<b>NF</b> NARROW FLOOD [24 DEGREE]	<b>POWDER COAT FINISHES</b> <b>BKP</b> BLACK <b>BMP</b> BRASS METALLIC <b>BNP</b> BRONZE <b>BTP</b> BLACK TEXTURED <b>GRP</b> GRAPHITE <b>GLP</b> GOLDTASTIC <b>MWP</b> MATTE WHITE <b>SGP</b> STEEL GRAY <b>SMP</b> SILVER METALLIC <b>SWP</b> SKY WHITE <b>WTP</b> WHITE TEXTURED	
	<b>S1SC</b> INDOOR SCONCE				<b>WF</b> WIDE FLOOD [50 DEGREE]
	<b>010B</b> OUTDOOR SCONCE (ETL LISTED FOR WET LOCATION)				
 FR1		<b>13</b> (FR1 ONLY)			

F LIGHT SOURCE		G VOLTAGE	H CONTROL	I OPTIONS
8"		<b>UNV</b> 120-277	<b>DM0</b> 0-10V DIMMING 10% (FR1 WITH 2LED1 ONLY) <b>DM1</b> 0-10V DIMMING 1% (NOT AVAILABLE IN 2LED1) <b>DM3</b> LUTRON HI-LUME ECOSYSTEM 1% (LDE1); FR1 ONLY, NOT AVAILABLE IN 2LED1	<b>ULD</b> DAMP LABEL (C1NA & S1SC ONLY) <b>BIOS</b> BIOS SKYBLUE™ OR BIOS SKYBLUE™ DYNAMIC LIGHT ENGINE* <b>HCL</b> HEX CELL LOUVER <b>SFL</b> SOFTENING LENS <b>SPL</b> SPREAD LENS <b>LSL</b> LINEAR SPREAD LENS <b>MOD</b> MODIFIED LUMINAIRE (CONTACT LOCAL REP)
<b>LED OUTPUT</b>	<b>COLOR TEMP</b>			
<b>LED1</b>	27K 30K 35K 40K			
13"				
<b>LED1</b>	27K			
<b>LED2</b>	30K			
<b>LED3</b>	35K 40K			
<b>2LED1*</b>				
<b>FR1 WITH S1SC OR 010B ONLY</b>				

LUMENS AND WATTAGE CHART			
		8"	13"
<b>LED1</b>	LUMENS DELIVERED	1500	1500
	SYSTEM WATTAGE	16	16
<b>LED2</b>	LUMENS DELIVERED	NA	2135
	SYSTEM WATTAGE	NA	26
<b>LED3</b>	LUMENS DELIVERED	NA	2855
	SYSTEM WATTAGE	NA	37
<b>2LED1*</b>	LUMENS DELIVERED	NA	2750
	SYSTEM WATTAGE	NA	32

UP TO **93** LM/W

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp.

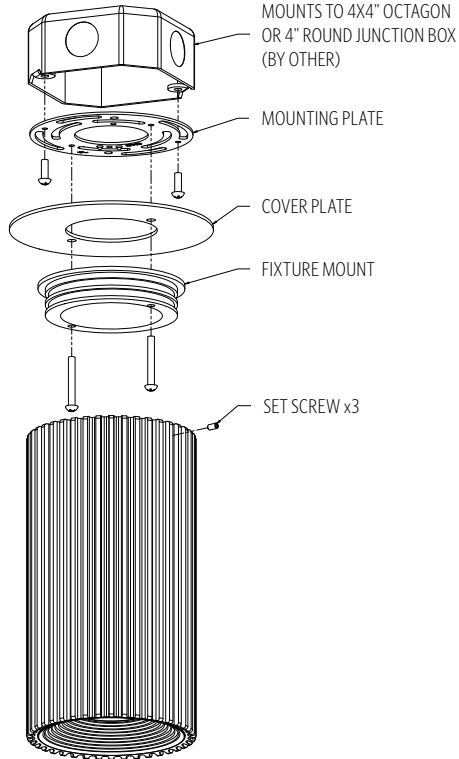
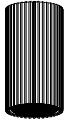
\*2LED1 is up/down illumination. LED1, LED2, & LED3 are same direction.

**SAMPLE CODE: FR2-S1SC-08-WF-BTP-LED1/35K-UNV-DM1-HCL**

\*Contact factory for BIOS SkyBlue® or BIOS SkyBlue® Dynamic light engine and control options.

## HANGING SYSTEM

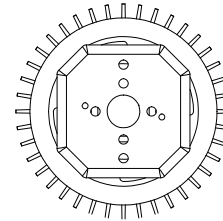
### C1NA INDOOR SURFACE CEILING MOUNT



#### MOUNTING INFORMATION CHART

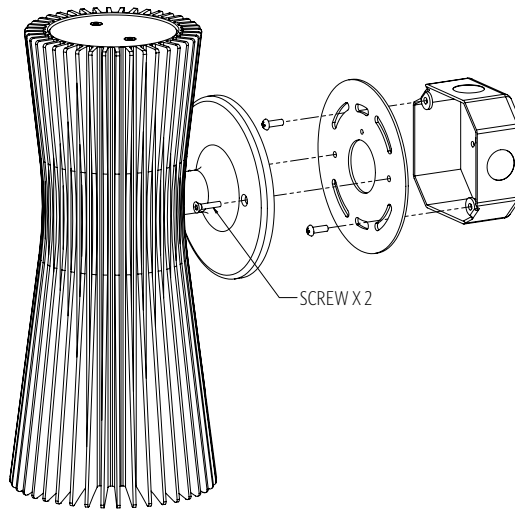
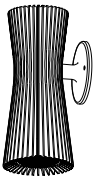
LUMINAIRE HEIGHT	LUMINAIRE WEIGHT	MOUNTING POINTS
8"	6 LBS	1
13"	9 LBS	1

Fixture is provided with 5" dia. cover plate finished to match the fixture body; if no visible cover plate is desired, a 3" mud ring should be pre-installed (supplied by others); 5" dia. cover plate can be discarded if unused.



MOUNTS TO 4X4" OCTAGON OR 4" ROUND JUNCTION BOX (BY OTHER)

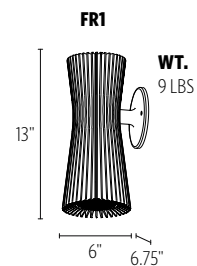
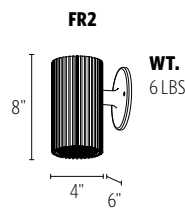
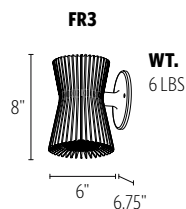
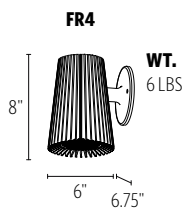
### S1SC INDOOR SCONCE O10B OUTDOOR SCONCE (ETL LISTED FOR WET LOCATION)



#### MOUNTING INFORMATION CHART

LUMINAIRE HEIGHT	LUMINAIRE WEIGHT	MOUNTING POINTS
8"	6 LBS	1
13"	9 LBS	1

## SIZES



## FINISH

### METALLIC POWDER COAT FINISHES:



### SOLID POWDER COAT FINISHES:



### TEXTURED POWDER COAT FINISHES:



**RAL®, Pantone®, or custom finishes are also available.**

These colors are for reference only. Please be aware that colors may vary per monitor. Contact your local rep for finish samples or with any questions.

## LIGHT SOURCE

LUMENS AND WATTAGE CHART		8" 13"	
		8"	13"
<b>LED1</b>	LUMENS DELIVERED	1500	1500
	SYSTEM WATTAGE	16	16
<b>LED2</b>	LUMENS DELIVERED	NA	2135
	SYSTEM WATTAGE	NA	26
<b>LED3</b>	LUMENS DELIVERED	NA	2855
	SYSTEM WATTAGE	NA	37
<b>2LED1*</b>	LUMENS DELIVERED	NA	2750
	SYSTEM WATTAGE	NA	32

STANDARD COLOR TEMPERATURE OPTIONS	CRI (RA)
2700K	80+
3000K	80+
3500K	80+
4000K	80+

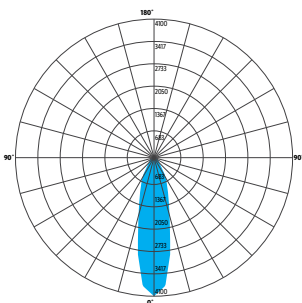
### PHOTOMETRY:

**FIXTURE:** FRI-P1CB-13-NF-PTD-1LD15/35K-120  
**COLOR TEMP #:** 3500K  
**OUTPUT:** 1500  
**EFFICACY:** 93 LM/W  
**TEST REPORT:** TEST NO. 18332.0

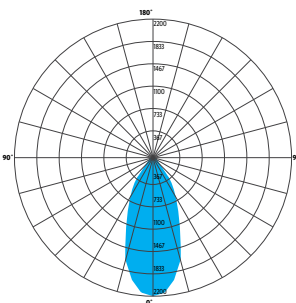
For all available IES files, please visit our website at [ocl.com](http://ocl.com).

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp.  
 \*2LED1 is up/down illumination. LED1, LED2, & LED3 are same direction.

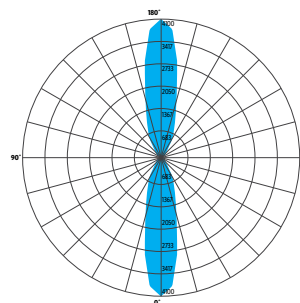
ZONE	NARROW FLOOD		WIDE FLOOD		NARROW FLOOD UP/DOWN (2LED1)		WIDE FLOOD UP/DOWN (2LED1)	
	LUMENS	% OF LUMINAIRE	LUMENS	% OF LUMINAIRE	LUMENS	% OF LUMINAIRE	LUMENS	% OF LUMINAIRE
0-30	1187	81%	1112	74%	1187	40%	1112	37%
0-60	1468	99.7%	1499	100%	1468	49%	1499	50%
0-90	1472	100%	1499	100%	1472	50%	1499	50%
0-120	-	-	-	-	2374	80%	2224	74%
0-150	-	-	-	-	2936	99%	2998	100%
0-180	-	-	-	-	2944	100%	2998	100%



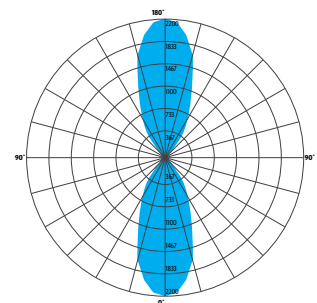
NARROW FLOOD



WIDE FLOOD



NARROW FLOOD UP & DOWN (2LED1)



WIDE FLOOD UP & DOWN (2LED1)

## CONTROL

### DMO 0-10V DIMMING DOWN TO 10% (FR1 WITH 2LED1 ONLY)

- 0-10V DIMMING
- 10% MINIMUM DIM LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MIN AMBIENT OPERATING TEMPERATURE -31°F
- FIELD REPLACEABLE

### DM1 0-10V DIMMING DOWN TO 1%

- 0-10V DIMMING
- 1% MINIMUM DIMMING LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MIN AMBIENT OPERATING TEMPERATURE = -31°F
- FIELD REPLACEABLE

### DM3 LUTRON HI-LUME ECOSYSTEM 1% (LDE1; FR1 ONLY)

- LUTRON DIGITAL ECOSYSTEM DIMMING
- 1% MINIMUM DIMMING LEVEL
- SOFT-ON / FADE-TO-BLACK
- ELECTRONIC DRIVER
- POWER FACTOR >0.9 @ 120V
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## OPTIONS

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### LSL LINEAR SPREAD LENS

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### MOD MODIFIED LUMINAIRE

- LUMINAIRE IS MODIFIED FROM STANDARD OPTIONS; CONTACT LOCAL REP FOR MORE INFORMATION

## SPECIFICATIONS

### CONSTRUCTION

- FIXTURE IS EXTRUDED AND MACHINED ALUMINUM
- HARDWARE IS ZINC PLATED OR STAINLESS STEEL

### LENSING

- STANDARD LENS INCLUDED FOR 2LED1 ONLY
- FOR SISA IN UPWARD FACING ORIENTATION, NOTE IN MODIFICATIONS AND A LENS WILL BE PROVIDED

### ELECTRICAL

- DIMMING ELECTRONIC DRIVER(S), COMES STANDARD WITH 0-10V DOWN TO 10%
- 0-10V DOWN TO 1% AND LUTRON ECOSYSTEM (LDE1) 1% ALSO AVAILABLE AS MODIFICATION (REQUIRES REMOTE DRIVERS; FR1 ONLY, NOT AVAILABLE IN 2LED1)
- BRIDGELUX COB
- LUMINAIRE CONNECTS TO BUILDING SUPPLY (120V-277V 50/60HZ) UNLESS DRIVERS ARE REMOTE

### LISTING

- SISC & CINA ETL LISTED TO UL 1598 FOR DRY LOCATIONS; ULD DAMP LOCATION LISTED IS OPTION
- O10B ETL LISTED TO UL 1598 FOR WET LOCATION

### WARRANTY

- 5 YEAR; ALL ELECTRICAL COMPONENTS RETAIN THE MANUFACTURER'S WARRANTY

### SUSTAINABILITY

- BIOS LIGHTING CONTRIBUTES TOWARD THE CIRCADIAN LIGHTING DESIGN FEATURE 54 UNDER THE WELL BUILDING STANDARD™ V1 AND FEATURE L03 UNDER THE WELL BUILDING STANDARD V2

## COMMON MODIFICATIONS

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- BIOS, TUNABLE WHITE, WARM-DIM, & RGBW LIGHT SOURCES
- SPECIFIC LUMEN OUTPUT
- MODIFIED CLUSTERS OR CONFIGURATIONS / MULTI-DROP CANOPIES
- VARIOUS SHAPES, ARCS, AND CURVES FOR LINEAR PROFILES AND RINGS
- CEILING OR SURFACE MOUNTING
- LARGE SCALE MODIFICATIONS
- RAL, PANTONE, BRAND-SPECIFIC, RETIRED OCL COLOR, OR CUSTOM FINISHES



- EMERGENCY BATTERY BACKUP OR INVERTER OPTIONS
- REMOTE DRIVERS / EXTENDED DISTANCE REMOTE DRIVERS
- DIMMING TO 0.1% (DIM TO DARK)
- NON-STANDARD SIZES OR LENGTHS
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## ZEDGE LINE

### Recessed Direct View Linear Line Voltage Steplight

**Concept:** Recessed linear LED steplight for indoor and outdoor applications.

**Materials:** Die-cast anodized aluminum body and external powder coated frame. <sup>A</sup>Consult factory for use in marine grade environments.

**Source:** LED High Efficiency Board.

**Optic:** Polycarbonate opal screen. Floor Washer frame allows for uniform optical distribution on the floor and excellent visual comfort.

**Mounting:** To be completed with PVC installation sleeve for flush or semi-flush installations. Secured with stainless steel spring system.

**Driver:** Integrated 4/1 driver (Non-dimmable / 0-10V / Reverse Phase / Forward Phase). Dimmable to 1%.

**Finish:** Textured Standard Finishes – Ferrite Grey / Heritage Brown / Bronze RAL 8019 / White / Black / Sandstone Grey

**Wattage:** 9W

**Color Temperature:** 2700K / 3000K / 3500K / 4000K

**CRI:** Ra84

**Delivered Lumens:** **2700K** 230Lm    **3000K** 245Lm    **3500K** 251Lm    **4000K** 257Lm

**Lumen Maintenance (L70):** 50,000hrs

*Calculation for LED fixtures are based on measurements that comply with IES LM-80.*

**Voltage:** Universal Voltage 120-277V AC 50/60Hz

**IK Rating:** IK10

**IP Rating:** IP66

**BUG:** B0-U1-G0

**Certifications:** cULus Listed Wet Location

Tested in accordance with LM-79-08

Energy efficient for California installations.

**Warranty:** 5 year limited warranty

Designed in collaboration with Gensler as Product Design Consultant

<sup>A</sup>Consult factory for use in marine grade environments. Not to be in direct contact with salt for extended periods of time or used with corrosive agents.



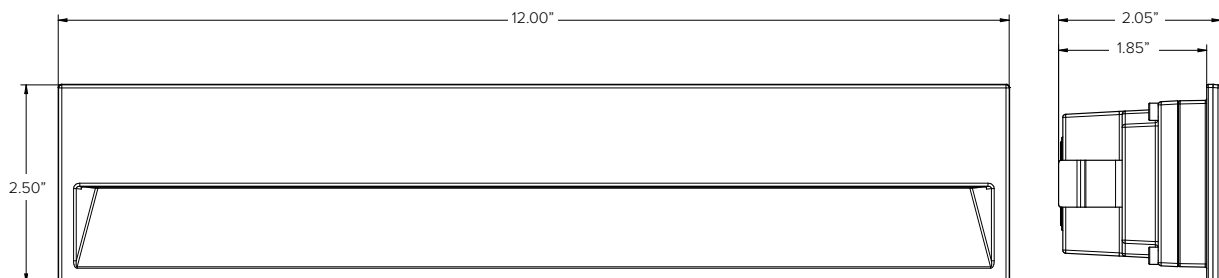
Shown in Ferrite Grey Finish



Suitable for indoor and outdoor applications.

PRODUCT CODE	DRIVER	OPTICS	FINISH	WATTAGE	COLOR TEMP	+	INSTALLATION
ZEL – ZEDGE LINE	41 – 4/1 Dimming (Non-Dimming / 0-10V / Reverse Phase / Forward Phase)	FW – Floor Washer	FE – Ferrite Grey	L2 – 9W	27 – 2700K	+	See page 2
HB – Heritage Brown			30 – 3000K				
BZ – Bronze RAL8019			35 – 3500K				
WT – White Textured			40 – 4000K				
BT – Black Textured							
SG – Sandstone Grey							

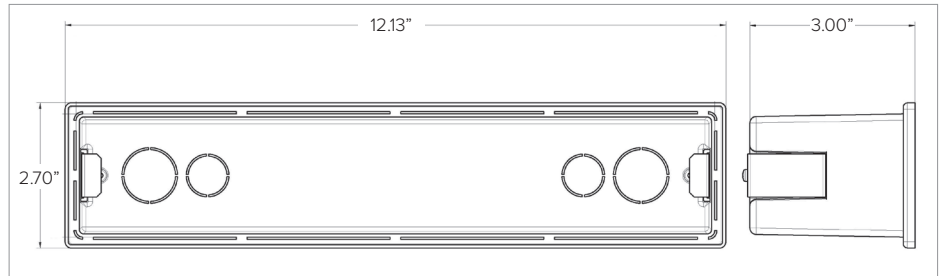
### Views



# TARGETTI

## ZEDGE LINE

INSTALLATION (REQUIRED)	
<b>1E3447</b>	PVC installation back box for flush or semi-flush installations, black finish. 3/4" and 1/2" knock-outs made for EMT connectors and conduit entry. Suitable for concrete pour, drywall, or stucco applications. Dimensions: 12.13"W x 2.70"H x 3.00"D



1E3447

### Photometry

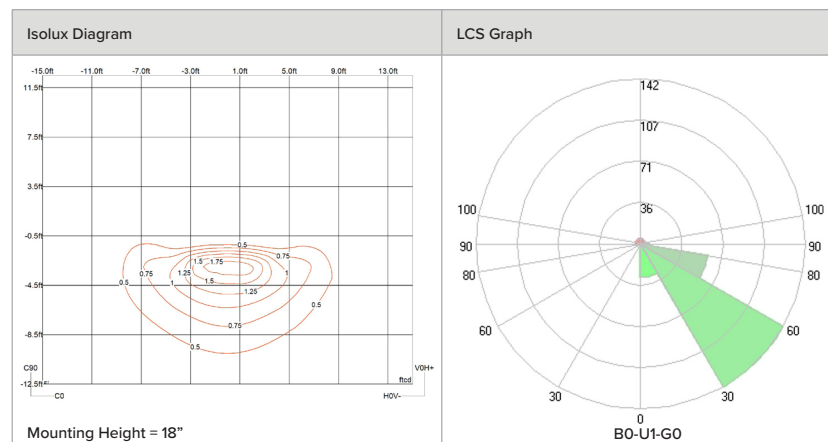
#### FLOOR WASHER

		2700K	H(m)	D1(m)	D2(m)	Emax(lx)	
		Ra84		48°	88°		
	Fixture Power	9W	1	1.90	2.12	155	
	Source Flux	1175lm	2	3.80	4.25	39	
	Fixture Flux	230lm	3	5.70	6.37	17	
	Efficacy	26lm/W	4	7.60	8.49	10	
TS1128	I <sub>max</sub> =174cd/klm	I <sub>max</sub>	204cd	5	9.50	10.61	6

		3000K	H(m)	D1(m)	D2(m)	Emax(lx)	
		Ra84		48°	88°		
	Fixture Power	9W	1	1.90	2.12	165	
	Source Flux	1250lm	2	3.80	4.25	41	
	Fixture Flux	245lm	3	5.70	6.37	18	
	Efficacy	27lm/W	4	7.60	8.49	10	
TS1128	I <sub>max</sub> =174cd/klm	I <sub>max</sub>	217cd	5	9.50	10.61	7

		3500K	H(m)	D1(m)	D2(m)	Emax(lx)	
		Ra84		48°	88°		
	Fixture Power	8W	1	1.90	2.12	169	
	Source Flux	1280lm	2	3.80	4.25	42	
	Fixture Flux	251lm	3	5.70	6.37	19	
	Efficacy	31lm/W	4	7.60	8.49	11	
TS1128	I <sub>max</sub> =174cd/klm	I <sub>max</sub>	222cd	5	9.50	10.61	7

		4000K	H(m)	D1(m)	D2(m)	Emax(lx)	
		Ra84		48°	88°		
	Fixture Power	9W	1	1.90	2.12	173	
	Source Flux	1310lm	2	3.80	4.25	43	
	Fixture Flux	257lm	3	5.70	6.37	19	
	Efficacy	29lm/W	4	7.60	8.49	11	
TS1128	I <sub>max</sub> =174cd/klm	I <sub>max</sub>	228cd	5	9.50	10.61	7



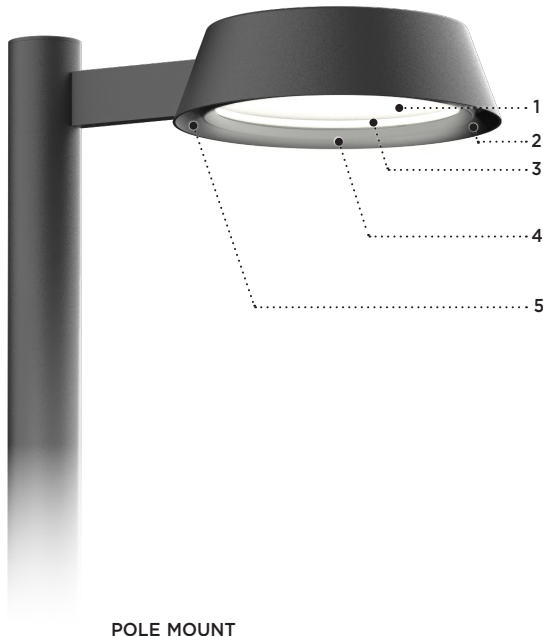


CEILING SURFACE/PENDANT/CATENARY/WALL MOUNT/POLE MOUNT/4" POST TOP

TYPE: \_\_\_\_\_ QUANTITY: \_\_\_\_\_ PROJECT: \_\_\_\_\_

CATALOG NUMBER:

MODEL LED SELECTION MOUNT CCT VOLTAGE FINISH OPTION OPTION



POLE MOUNT

- 1- Comfort Series
- 2- Corrosion resistant diecast aluminum housing
- 3- Indirect LED lighting on highly reflective dome for visual comfort
- 4- Clear tempered glass
- 5- All stainless steel hardware



### MATERIALS

Clermont is made of aluminum diecast offering exceptional precision and durability. The main housing is sealed with durable gasket.

LED boards are hidden between coated polymer that diffuses and reflects the light at 96%. It is UV stabilized and antistatic, which does not attract dust.

The driver is preinstalled inside the main housing, sealed with gasket, and secured with four captive screws which makes it easy for maintenance.

### ELECTRICAL

**DRIVER** Standard driver is 0-10V dimming-ready (dims to 10%) with: 120-277 multi-volt compatibility (50-60Hz), operating temperature range of -40°C to +55°C -40°F to +131°F, output over voltage protection, output over current protection and output short circuit protection with auto-recovery. Optional 347/480V available.

**LED** Offered in 2700K, 3000K, 3500K & 4000K at 80CRI.

### LIFE

60,000hrs L<sub>70</sub>B<sub>50</sub> (based on LM-80 report for lumen maintenance)

### FINISH

Five-stage preparation process includes preheating of cast aluminum parts for air extraction. Polyester powder coating is applied through an electrostatic process, and oven cured for long term finish.

### MOUNTING

Maximum weight: 27 lbs (12 kg)

Several mounting options are offered with this product: catenary, wall mount, ceiling mount, pendant, post-top and pole mount.

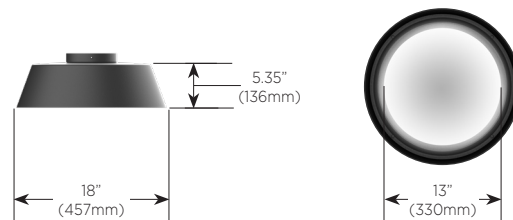
For SPG, STM, CK, WM mounting: The mounting plate is designed to fit on a 4" (102mm) octagonal electrical box using 3.5" (89mm) C/C mounting holes. For PM mounting: designed to fit on 4" or 5" OD pole. For PT mounting: designed to fit on 4" OD pole with 1/4" or 1/8" wall thickness. For CAT3: see mounting details on page 3.

### CERTIFICATION

Certified and approved as per CSA C22.2 No.: 250.0 standard and ANSI/UL 1598 standard, for wet location. Rated IP65/IK10.

Photometric testing performed by an independent laboratory in accordance with IES LM-79-08 standards at 25°C.

Lumen depreciation in accordance with IESNA LM80 standards.





# CT180 SERIES CLERMONT

## LUMINAIRE SELECTION

### 1 MODEL



CT180

### 2 LED LIGHT SELECTION (4000K/80CRI)

#### WHITE LED SELECTION

SUFFIX	DELIVERED LUMENS	INPUT WATTS
<input type="checkbox"/> L2L25	2639	25W
<input type="checkbox"/> L2L35	3695	35W
<input type="checkbox"/> L2L45	4360	45W
<input type="checkbox"/> L2L50	4996	55W
<input type="checkbox"/> L2L55	5604	65W

#### TUNABLE WHITE\*

SUFFIX	DELIVERED LUMENS	INPUT WATTS
<input type="checkbox"/> L2LWT	5000	57W

\*2700K-5000K/80 CRI

#### WARM DIMMABLE\*

SUFFIX	DELIVERED LUMENS	INPUT WATTS
<input type="checkbox"/> L2LDW	5000	57W

\*2200K-4000K/80 CRI

### 3 MOUNT

- CK Ceiling
- SPG\* Pendant (cable)
- STM Pendant (stem)
- CAT3 Catenary
- WM Wall mount
- PM Pole mount
- PT<sup>1</sup> Post top\*\*

\* Indoor only

\*\* Compatible with 4" O.D./100mm pole (PAA4)

### 4 CCT

#### TEMPERATURE\*

- K27 2700K
- K30 3000K
- K35 3500K
- K40 4000K

\* 80 CRI

### 5 VOLTAGE

#### STANDARD

- 120V
- 208V
- 240V
- 277V

#### OPTIONAL

- 347V
- 480V

### 6 FINISH

#### STANDARD COLORS\*

- WHT Snow white
- BKT Jet black
- BZT Bronze
- MST Matte silver
- GRT Titanium gray
- DGT Gun metal
- CHT Champagne
- SGT Steel gray
- BGT English cream

#### OPTIONAL COLORS

- CS Custom color
- RAL RAL# color

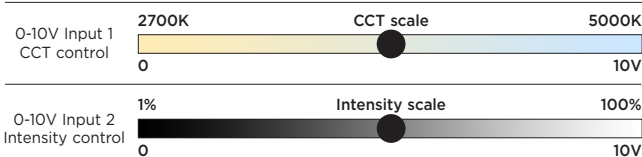
\* Refer to color chart



For IDA certification compliance, luminaire must be ordered with 3000K or warmer.

## TUNABLE WHITE

User can modify the correlated color temperature (CCT) and intensity of the source using two slider controls or an intelligent lighting management system.



## WARM DIMMING

Warm dimming (0-10V) lowers the LED temperature (CCT) as it is dimmed. The lower the brightness, the warmer the CCT.



## OPTIONS

### SURGE PROTECTOR

- SP 10kV surge protector

### FUSE

- FS Fuse

### ACCESSORIES

- BLC Visor for back light control
- SSC<sup>2</sup> Set of three stabilizer cables For stem mount only

### EMERGENCY

- EMLC<sup>3</sup> Integral battery backup for LED, 90 min., 7W integral to luminaire
- REML Remote mount battery back for LED 90 min., 7W integral to luminaire

### CONTROLS

- NLTAIR<sup>4</sup> nLight AIR Control gen2 embedded on housing
- NLTAIR-MS<sup>7</sup> nLight AIR 2.0 motion sensor module mounted on pole
- RD Remote driver Consult factory

### PHOTOCELL

- PH7<sup>5</sup> NEMA C136.41 7-PIN receptacle with photocell sensor preinstalled
- PHSC<sup>5</sup> NEMA C136.41 7-PIN receptacle with shorting cap preinstalled

### MOTION SENSOR

- MS<sup>6</sup> Motion sensor module, mounted on pole 270° coverage. (Black or white) will be selected to best match fixture color.

### ENVIRONMENT

- MG Marine grade paint for harsh, coastal environment and exposure to salt water Longer lead time may apply please contact factory for info
- NT Natatorium (only available in WHT and BKT)

## NOTES

- 1- Compatible with 4" O.D. pole only with 1/4" or 1/8" wall thickness.
- 2- SSC applicable to STM mount only
- 3- EMLC is integral to luminaire housing. Integral is not suitable under 0°C (32°F) outdoor.
- 4- NLTAIR not compatible with CK. Compatible with SPG, STM, CAT3, WM, PM and PT.
- 5- PH7 and PHSC are not available with CK, SPG, STM and CAT3.
- 6- MS not available with CK, SPG, STM, CAT3, WM mount. Motion sensor module mounted on pole.
- 7- NLTAIR-MS not available with CK, SPG, STM, CAT3, WM mount. Motion sensor nLight air module mounted on pole.

## MOUNTING DETAILS

**STEM (STM)**  
Heavy duty 45° hang straight swivel, with Ø 4.5" (114mm) canopy and universal mounting plate. Ø 7/8" x 36" (22mm x 914mm) suspension stem with aircraft safety cable. Other lengths on request (specify STM with desired length).

**AIRCRAFT CABLE (SPG)**  
4/18 X 36" lg. silver braided power cable c/w on site adjustable aircraft cable, consisting of 3 x 36" (610mm) long cables joined Ø 4.5" (114mm) canopy. Other cable length available on request, minimum 18" (total).

**SSC**  
Set of three stabilizer cables. For stem mount only.

**CAT3**  
Cast aluminum catenary junction box with 4 sealed connectors by Luminis and pre-inserted into housing.  
Ready to accept 1/4" or 1/2" stainless steel suspension cable.  
Weight: 29.5 lbs (13.4 kg)  
(Structural design, power cable, control cable, stainless steel catenary cable, cable fittings, and fittings for mounting to support structure provided by others.)

**ANGLE ADJUSTMENT MECHANISM**  
12° ↑  
12° ↓

**Power cable in:**  
3 conductor x 14 gauge AWG. The 2 cable glands located at the top can accommodate a cable ranging from 10mm - 14mm.

**Control cable in:**  
The 2 cable glands on the bottom can accommodate a cable ranging from 6mm - 11mm.

**BLC**  
180° visor for back light control. Field installable.

**CEILING MOUNT**

**POST TOP**

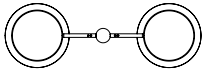
**POLE MOUNT**

**WALL MOUNT**

## MULTIPLE LUMINAIRE MOUNTINGS

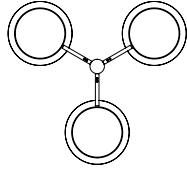
These following 5 configurations are for reference only. They must be selected with the pole. Refer to the separate pole specification for details.

To specify these assemblies: Fixture quantity should be total number of fixture heads, and include the given code on the Luminis pole catalog number.



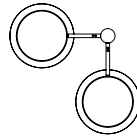
**PM2-180**  
Twin mount  
180° offset

Installation on  
4" and 5" poles



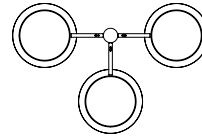
**PM3-120**  
Triple mount  
120° offset

Installation on  
4" and 5" poles



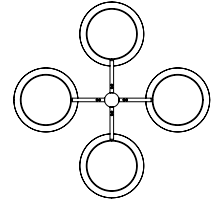
**PM2-90**  
"L" mount  
90° offset

Installation on  
4" and 5" poles



**PM3-90**  
Triple mount  
90° offset mounting

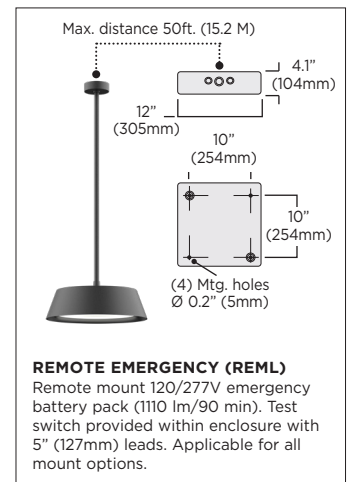
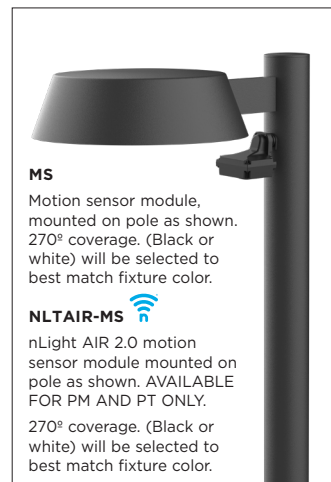
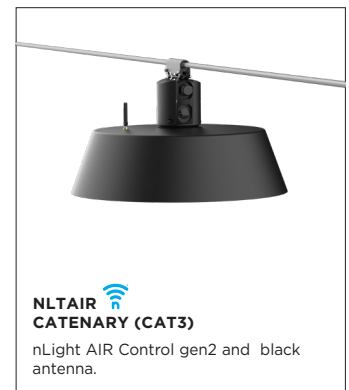
Installation on  
4" and 5" poles



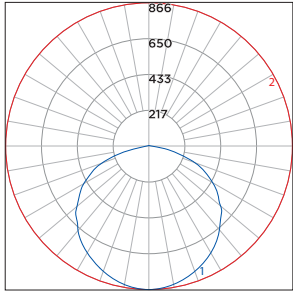
**PM4-90**  
Quad mount

Installation on  
4" and 5" poles

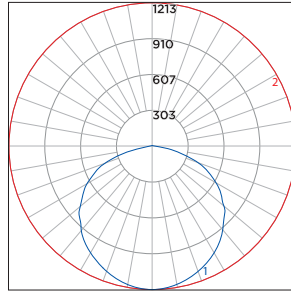
## ELECTRICAL DETAILS



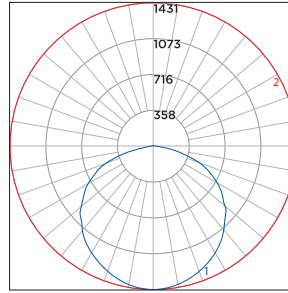
## TYPICAL PHOTOMETRY SUMMARY



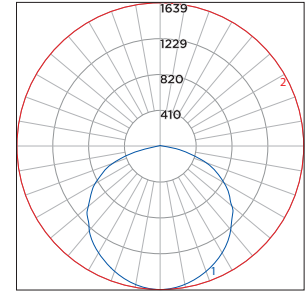
**CT180-L2L25**  
 Total Lms: 2647 Lumens  
 Total input watts: 25W  
 Efficacy: 106 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 866 @ 180°H/2°V  
 BUG: B1-U0-G0



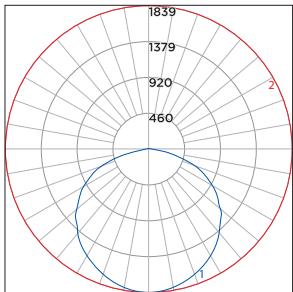
**CT180-L2L35**  
 Total Lms: 3695 Lumens  
 Total input watts: 35W  
 Efficacy: 106 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 1213 @ 180°H/2°V  
 BUG: B1-U0-G1



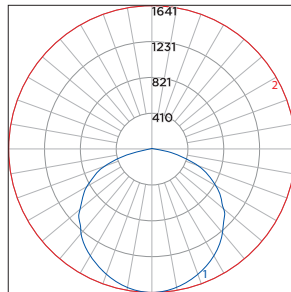
**CT180-L2L45**  
 Total Lms: 4360 Lumens  
 Total input watts: 45W  
 Efficacy: 97 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 1431 @ 180°H/2°V  
 BUG: B2-U0-G1



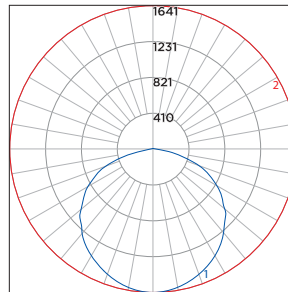
**CT180-L2L50**  
 Total Lms: 5012 Lumens  
 Total input watts: 50W  
 Efficacy: 91 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 1639 @ 180°H/2°V  
 BUG: B2-U0-G1



**CT180-L2L55**  
 Total Lms: 5622 Lumens  
 Total input watts: 65W  
 Efficacy: 86 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 1839 @ 180°H/2°V  
 BUG: B2-U0-G1



**CT180-L2LWT**  
 Total Lms: 5016 Lumens  
 Total input watts: 57W  
 Efficacy: 88 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 1641 @ 180°H/2°V  
 BUG: B2-U0-G1



**CT180-L2LDW**  
 Total Lms: 5016 Lumens  
 Total input watts: 57W  
 Efficacy: 88 Lumens/Watt  
 CCT/CRI: 4000K/80CRI  
 Maximum candela: 1641 @ 180°H/2°V  
 BUG: B2-U0-G1

### LUMEN CONVERSION FACTOR (LCF)

CCT	LCF	CRI
2700K	0.91	80
3000K	0.94	80
3500K	0.98	80
4000K	1.00	80

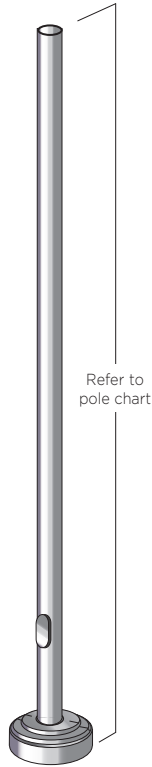
All Photometry shown use the Standard 80CRI 4000K LEDs.

Please visit our web site [www.luminis.com](http://www.luminis.com) for complete I.E.S. formatted download data

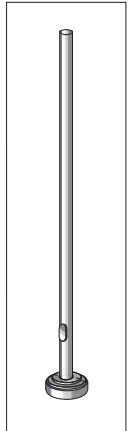
TYPE: \_\_\_\_\_ QUANTITY: \_\_\_\_\_ PROJECT: \_\_\_\_\_

CATALOG NUMBER:

FIXTURE    WATTAGE    VOLTAGE    FINISH    OPTION    OPTION    OPTION    OPTION



PAA4



Components are made of corrosion resistant 356 aluminum alloy with a copper (CU) content of less than 0.1%. All poles are designed to offer maximum resistance to wind load performing with an array of accessories and luminaire attachments.

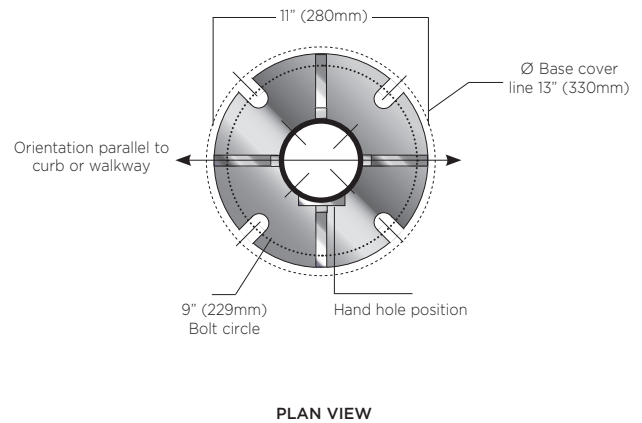
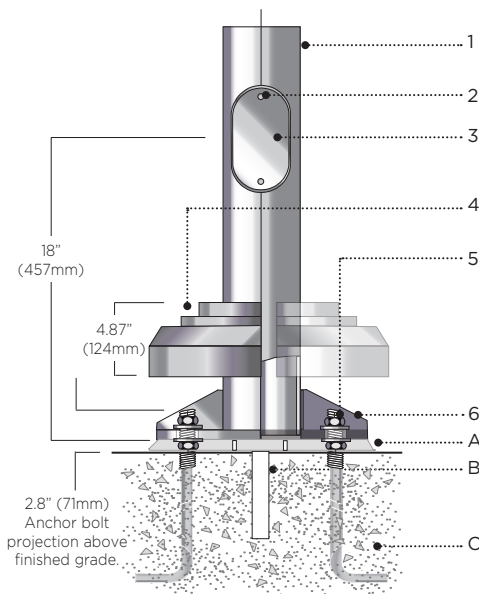
- 1- 4" (100mm) O.D X 0.125" (3mm) wall. 6061-T6 Aluminum alloy pole.
- 2- Stainless steel hardware.
- 3- 2"X4" cast aluminum wiring accessed through structurally reinforced opening. Flush mount cover.
- 4- Two piece structural cast aluminum base cover. 4.875" (124mm) X Ø 13" (330mm).
- 5- Set of (8) 3/4" hot dip galvanized nuts with washers and (4) galvanized steel anchor bolts.
- 6- One piece cast aluminum T6 heat treated base, structurally reinforced with four integral gussets and collar insert to maximize pole strength.

#### FINISH

Five-stage preparation process includes preheating of cast aluminum parts for air extraction. Polyester powder coating is applied through an electrostatic process, and oven cured for long term finish.

#### NOTES


- A- Grout to be packed under pole base to ensure full adherence and stability with footing and prevent loosening of leveling nuts. Provide adequate channel drainage from inside pole (by others).
- B- Electrical conduit (by others).
- C- Concrete footing (by others).



# PAA4 SERIES

## 4" Straight Round Aluminum Pole

### POLE SELECTION

MODEL#	Model#	Pole height	Wall	WIND LOAD (EPA)						
				80 MPH	90 MPH	100 MPH	110 MPH	150 MPH	170 MPH	180 MPH
 <input type="checkbox"/> PAA4	<input type="checkbox"/> PAA410	10FT (3.0M)	.125" (3mm)	10.2	7.7	5.9	4.6	2.1	1.6	1.3
	<input type="checkbox"/> PAA410-1		.188" (5mm)	15.7	12.0	9.4	7.5	3.7	2.8	2.4
	<input type="checkbox"/> PAA410-2		.226" (6mm)	18.9	14.6	11.5	9.2	4.6	3.5	3.1
	<input type="checkbox"/> PAA412	12FT (3.6M)	.125" (3mm)	7.9	5.8	4.3	3.2	1.3	0.9	0.7
	<input type="checkbox"/> PAA412-1		.188" (5mm)	12.5	9.5	7.3	5.6	2.6	1.9	1.7
	<input type="checkbox"/> PAA412-2		.226" (6mm)	15.2	11.6	9.0	7.1	3.4	2.5	2.2
	<input type="checkbox"/> PAA414	14FT (4.2M)	.125" (3mm)	6.0	4.3	3.0	2.0	0.6	0.4	0.3
	<input type="checkbox"/> PAA414-1		.188" (5mm)	10.1	7.5	5.6	4.2	1.8	1.2	1.1
	<input type="checkbox"/> PAA414-2		.226" (6mm)	12.4	9.3	7.1	5.4	2.4	1.8	1.5
	<input type="checkbox"/> PAA416	16FT (4.8M)	.125" (3mm)	4.5	3.0	1.9	1.1	---	---	---
	<input type="checkbox"/> PAA416-1		.188" (5mm)	8.1	5.8	4.2	3.0	1.1	0.7	0.5
	<input type="checkbox"/> PAA416-2		.226" (6mm)	10.2	7.4	5.5	4.1	1.6	1.1	0.9
<input type="checkbox"/> PAA418	18FT (5.5M)	.125" (3mm)	3.2	1.9	0.9	0.2	---	---	---	
<input type="checkbox"/> PAA418-1		.188" (5mm)	6.3	4.3	2.9	1.9	0.4	0.2	0.1	
<input type="checkbox"/> PAA418-2		.226" (6mm)	8.1	5.8	4.1	2.8	0.9	0.6	0.4	
<input type="checkbox"/> PAA420	20FT (6.0M)	.125" (3mm)	2.0	0.9	0.1	---	---	---	---	
<input type="checkbox"/> PAA420-1		.188" (5mm)	4.8	3.1	1.8	0.9	---	---	---	
<input type="checkbox"/> PAA420-2		.226" (6mm)	6.4	4.3	2.9	1.8	0.3	0.1	---	

### FINISH

#### STANDARD COLORS\*

- WHT Snow white
- BKT Jet black
- BZT Bronze
- MST Matte silver
- GRT Titanium gray
- DGT Gun metal
- CHT Champagne
- SGT Steel gray
- BGT English cream

#### OPTIONAL COLORS

- CS Custom color
- RAL RAL# color

\*Refer to color chart

ANCHOR BOLTS: 3/4"-10 X 18" lg. X 3" leg.

### OPTIONS

#### ELECTRICAL

- FS Fuse<sup>1</sup>
- PH Photocell<sup>1</sup>
- GFI Ground fault circuit interruption receptacle<sup>2</sup>
- CGF Ground fault circuit interruption with clear in-use cover<sup>2</sup>

#### FAUX WOOD COLORS<sup>5</sup>

- |   |                                       |
|---|---------------------------------------|
| <input type="checkbox"/> ADG American douglas | <input type="checkbox"/> MPL Maple    |
| <input type="checkbox"/> BRC Birch            | <input type="checkbox"/> OFL Oak      |
| <input type="checkbox"/> CHN Chestnut         | <input type="checkbox"/> RSW Rosewood |
| <input type="checkbox"/> CRY Cherry           | <input type="checkbox"/> TEK Teak     |
| <input type="checkbox"/> KNP Knotty pine      | <input type="checkbox"/> WLN Walnut   |

#### ACCESSORIES

- BNR Vertically adjustable 24" banner support (single arm at top)<sup>3</sup>
- 2BNR Two vertically adjustable 24" banner supports (arm at top & bottom)<sup>3</sup>
- BNF Fixed 24" banner support (single arm at top)<sup>4</sup>
- 2BNF Two fixed 24" banner supports (arm at top & bottom)<sup>4</sup>
- BNF180 Two fixed 24" banner supports at 180° (arms at top only)<sup>4</sup>
- 2BNF180 Four fixed 24" banner supports at 180° (arms at top & bottom)<sup>4</sup>

#### NOTES

- 1- PH: Photocell and/or FS: Fuse options are installed by default with pole when specified with luminaire. (Factory may change location as per design requirement.)
- 2- GFI and CGF options are located on the same side as the hand hole (placed right above) and installed 24" above grade unless otherwise specified.
- 3- BNR & 2BNR are not available in 180°.
- 4- BNF, 2BNF, BNF180 & 2BNF180 are factory set in position as required. Location along pole to be specified.
- 5- Faux wood finish not applied to base cover, hand-hole or accessories.

**IMPORTANT:** - Poles are designed to fit Luminis luminaires and there respective optional attachments, excluding all other mechanical or finishes applications. (Please consult factory otherwise.)  
- Poles shall not be erected without the Luminaire installed and base grout adequately applied.



**OPTIONS**

**MOUNTING**



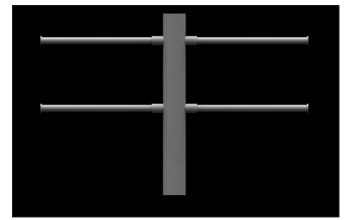
**BNF:** Fixed 24" banner support



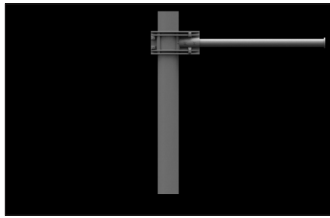
**2BNF:** Two fixed 24" banner supports



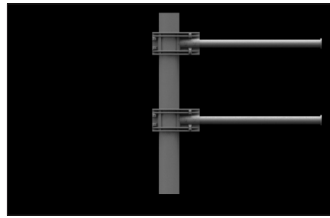
**BNF180:** Two fixed 24" banner supports  
at 180°



**2BNF180:** Four fixed 24" banner  
supports at 180°



**BNR:** Vertically adjustable 24" banner  
support



**2BNR:** Two vertically adjustable 24"  
banner supports

# BSS305 | TASK

UC

Under cabinet LED luminaire

Project: \_\_\_\_\_ Type: \_\_\_\_\_



## FEATURES

Quality LED illumination and several control options make the BSS305 luminaire an ideal task light. The robust, 23"-56" nominal length fixtures feature an acrylic lens, multiple light output choices, dimming driver capability and an occupancy sensor option.

## SPECIFICATIONS

Fully assembled housing is formed and welded, 20 ga. steel, chemically treated to resist corrosion and enhance paint adhesion

Standard finishes as shown below

Knock-outs accept standard electrical fittings (by others)

Available in nominal lengths of 2'-5'

Includes frosted acrylic lay in lens

Standard integral 120-277V driver offered with 0-10V dimming or non-dim (other dimming driver options available)

Options include 120V or 277V on/off rocker switch and passive infrared occupancy sensor

Standard outputs are 545 and 740 lumens per foot

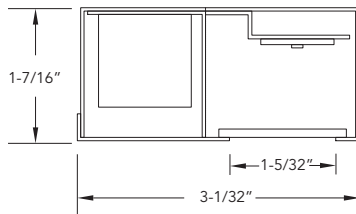
LEDs available in 2700K, 3000K, 3500K, and 4000K, within a 3 step MacAdam ellipse, all with 90+ CRI typical

Life: 50,000 hours L<sub>70</sub>

Limited five year warranty

UL and C-UL listed for dry and damp locations

## SECTION



## PERFORMANCE

NOMINAL LENGTH	OUTPUT	LUMENS/ft.	WATTS/ft.	LUMINAIRE LUMENS	EFFICACY
4'	L: low	545	5.6	2000	97
	R: regular	740	7.9	2722	96



\*Note: All data reflects fixtures with 3500K LEDs

## BSS305 -

### FIXTURE LENGTH

- 2: 22-3/16"
- 3: 33-3/16"
- 4: 44-3/16"
- 5: 55-3/16"

### CORRELATED COLOR TEMPERATURE

- 27: 2700K-90+ CRI
- 30: 3000K-90+ CRI
- 35: 3500K-90+ CRI
- 40: 4000K-90+ CRI

### DRIVER

- ND: non-dimming
- [Dimming]
- D: 0-10V, 1%
- DTR: triac, 1%
- DLV: electronic low voltage, 1%
- HES: Lutron EcoSystem, soft-on fade-to-black, 1%
- EL: eldoLED ECOdrive 0-10V, 1%
- ES: eldoLED SOLOdrive 0-10V, 0.1%
- ELD: eldoLED ECOdrive DALI, 1%
- ESD: eldoLED SOLOdrive DALI, 0.1%

### LIGHT OUTPUT (lumens per foot)

- L: low – 545
- R: regular – 740
- CF: consult factory for custom output

### LENS

- F: frosted acrylic

### OPTIONS

- SW1: rocker switch 120V
- SW2: rocker switch 277V
- OC: occupancy sensor

### FINISH


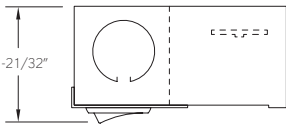

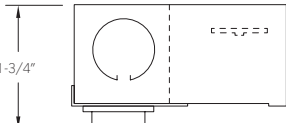

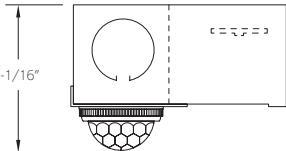
- AW: architectural white (semi-matte)
- WH: white (semi-gloss)
- BL: black (semi-matte)
- MB: matte black
- ESS: environmental satin silver
- BZ: bronze
- PR: primer
- CF: consult factory for custom finish



# BSS305 | TASK

Under cabinet LED luminaire

## OPTIONS

	ORDERING CODE	DESCRIPTION	
	SW1	<b>ROCKER SWITCH 120V</b> On/off 120V, 10 Amp rocker switch in white or black finish (dependent on fixture finish)	
	SW2	<b>ROCKER SWITCH 277V</b> On/off 277V, 20 Amp rocker switch in black finish only	
	OC	<b>OCCUPANCY SENSOR</b> Passive infrared occupancy sensor with hold-off day-lighting adjustment (10-120 foot candles) and time delay adjustment from 30 seconds to 30 minutes	

113148000-00644091



fitted with

work equipment  
connected load  
power consumption  
luminous flux  
luminous efficacy  
illuminance efficiency factor  
light colour  
color rendering index (CRI)  
consistent white light of  
glare-free  
class of protection  
technology  
luminaire body  
lamp cover  
tubular sections  
balance of articulation joints  
weight (net)  
mains lead

fastening

special features

LED

Energy efficiency category A+  
electronic plug-in transformer  
100-240 V; 50/60 Hz  
approx. 8 W  
approx. 550 lm  
approx. 68 lm/W  
102 lx/W  
neutral white, approx. 4000 K  
> 90 (R9>50)  
< 4 SDCM  
plastic reflector  
II with plug-in power supply  
continuously dimmable  
aluminium, painted, black  
screen, clear  
tubular aluminium section, painted, black  
friction  
approx. 1.0 kg (2.2 lb)  
approx. 3 m (9.84 ft); mains plug  
US-ConnectionStandard  
adaptor (accessory), table base (accessory), table  
clamp (accessory)  
automatic switchoff adjustable, push button in  
luminaire head, behaviour at net recovery  
adjustable



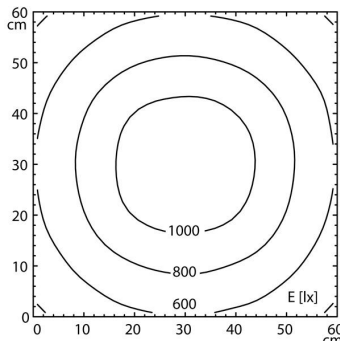
\* Separate ENEC certification for luminaire and power supply



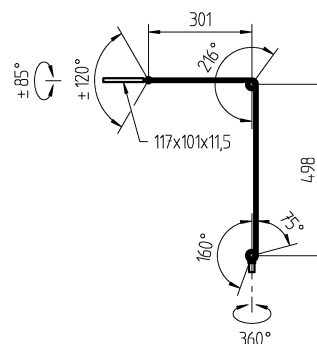
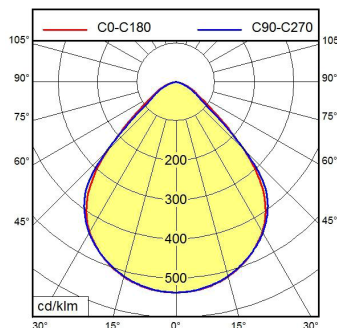
NEMA 1-15P

illuminance

distance: 50 cm  
Em: 775 lx  
Emax: 1166 lx  
Emin: 430 lx



luminous intensity



**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX E  
MECHANICAL NOISE ASSESSMENT  
MEMORANDUM**

## MEMORANDUM

---

**DATE:** 25 January 2023

**NAME:**  
Dana Bazzi

**COMPANY:**  
ELS

**EMAIL:**  
dbazzi@elsarch.com

**FROM:** Eric Yee

**SUBJECT:** Willard Park Community Center  
Mechanical Noise Assessment

**PROJECT:** XX-XXXX

---

Dana,

Based on our review of the 80% CD set, we have prepared the following memo of our acoustical recommendations.

### **SECTION I ENVIRONMENTAL NOISE IMPACTS**

#### **Introduction**

The project includes the addition of an outdoor air-to-water heat pump. This heat pump sits on the new roof in a mechanical well along the west property line. Directly west are homes along Regent Street that will back up to the new Community Center.

#### **Criteria**

##### ***City of Berkeley Municipal Code***

Section 13.40.050 Exterior Noise Standards provides the maximum allowable noise level based on the zoning. The ordinance also has provisions for elevated noise levels and exposure limits. See the excerpt on the next page.

---



- (e) The noise standard for that land use as specified in Table 13.40-1 plus 20 dBA for any period of time.

**Table 13.40-1. EXTERIOR NOISE LIMITS**

(Levels not to be exceeded more than 30 minutes any hour)

Zoning District	Time Period	Noise Level (dBA)
R-1, R-2, R-1A, R-2A, and ESR	7:00 a.m. – 10:00 p.m.	55
	10:00 p.m. – 7:00 a.m.	45
R-3 and above	7:00 a.m. – 10:00 p.m.	60
	10:00 p.m. – 7:00 a.m.	55
Commercial	7:00 a.m. – 10:00 p.m.	65
	10:00 p.m. – 7:00 a.m.	60
Industry	Anytime	70

3. If the measured ambient noise level is greater than the level permissible within any of the noise limit categories above, the sound level when measured on any other property shall not exceed:
- (a) The ambient noise level for a cumulative period of more than 30 minutes in any hour; or
  - (b) The ambient noise level plus 5 dBA for a cumulative period of more than 15 minutes in any hour; or
  - (c) The ambient noise level plus 10 dBA for a cumulative period of more than 5 minutes in any hour; or
  - (d) The ambient noise level plus 15 dBA for a cumulative period of more than 1 minute in any hour; or

Based on the most recent zoning map, the project is located in Zone R-2, which limits property line noise to 55 dBA at the daytime (7:00 am to 10:00 pm) and 45 dBA at the nighttime (10:00 pm to 7:00 am).

## Analysis

According to manufacturer's data, the ASHP sound power level is 71 dBA. This unit is located about 6 feet from the homes to the west of the project. The unit also sits in a mechanical well with an 8-foot talk barrier.

Based on the data and site geometry, the expected noise level from ASHP would be 48 dBA. This noise level complies with the maximum daytime noise limits set forth in the Berkeley Municipal Code. But it exceeds the maximum nighttime noise limit of 45 dBA.

To comply with both daytime and nighttime noise limits, the interior of the mechanical well walls should be lined with an acoustically absorptive material such as Pyrok Acoustament 40 or Kinetics KNP absorbers. The additional absorption would minimize sound build up in the mechanical well and reduce over noise levels in compliance with the municipal code.

## SECTION II – MECHANICAL NOISE AND VIBRATION

### Acoustical Criteria

#### A. Background Noise Levels

The design-build contractor is responsible for achieving the following Noise Criteria:

Noise Criteria	Space Type - Rooms	Maximum Velocity (feet per minute)	
		Branch Duct	Diffuser Neck
NC 30	Office, Community Room	480	380
NC 35	Lobby	550	450
NC 40	Restroom, Kitchen	660	560

Subsequent to the final air balancing, the Contractor is to measure the sound pressure levels in each space and submit a report graphing the octave band sound levels showing the NC rating with the HVAC system operating at full speed and with the system off. The Contractor shall adjust and/or repair the system as necessary to meet the criteria under all operating conditions without additional cost to the owner.

The following table summarizes the maximum duct airflow velocities needed to achieve specified NC ratings:

Main Duct Location	NC	Maximum Velocity (feet per minute)	
		Rectangular Duct	Round Duct
In Shaft or Above Drywall Ceiling	35	2000	3000
	45	3000	4500
Above ACT Ceiling	35	1200	2000
	45	2000	3000
Exposed Duct	35	900	1500
	45	1500	2500

## General

1. Do not locate mechanical equipment on the roof or in ceiling cavities over spaces with criteria of NC 30 or less.
2. Mechanical and electrical equipment must not contact the walls or ceilings of spaces with criteria of NC 30 or less.
3. Ducts, pipes and conduit serving other spaces must not pass through spaces with criteria of NC 30 or less and are typically served from the adjacent corridor.
4. Provide a 1-inch clearance between all pipes, ducts, ceiling wires and framing unless otherwise stated.

## Ducts

1. Line the first 10 feet of supply and return duct from the ERV with 1 inch-thick internal lining.
2. Ductwork should have smooth transitions not exceeding 10 degrees. Use radiused-duct turns, take-offs and elbows over spaces having noise criteria of NC 30 and less. Avoid using bullhead tees and 90-degree elbows in medium and high-pressure ducts.
3. Provide lined sheet metal duct and/or sound attenuators to prevent cross-talk between rooms separated with insulated walls or provide lined sheet metal air transfer boots having 1-inch-thick internal insulation and a minimum 6-foot total length. This may be required at Room 109 as there is no air return path.
4. Provide sheet metal duct at penetrations of sound-rated walls and seal airtight with backer rod and acoustic sealant.
5. For rooms having a noise criterion of NC 30 and less, provide 10 feet of internally lined sheet metal duct. Use 1-inch-thick lining..
6. Limit insulated flexible duct to three feet and require low noise acoustical inner liner to prevent regenerated noise. Do not penetrate sound-rated construction with flexible duct.
7. Do not allow ductwork to directly contact framing or gypsum board in sound rated construction. Provide a minimum 1-inch clearance between ducts and adjacent gypsum board surfaces.

## Grilles And Registers

1. Select registers, diffusers and grilles to have an NC rating 5 points below the required to account for multiple devices.
2. For spaces having a noise criterion above NC 30, limit exposed duct velocities in the room to 650-feet-per-minute and discharge velocities to 380-feet-per-minute.



3. Provide volume dampers with a minimum 6-foot distance upstream of the discharge.

### Energy Recovery Units (ERV) And Heat Pumps (ASHP)

1. Select boxes with sound power levels meeting the Noise Criteria. Limit box upstream static pressure to 1-inch.
2. Do not locate boxes in or above spaces having NC 30 but rather in adjacent corridor and storage areas.

### Mechanical Equipment Vibration Isolation

1. Provide external unhoused steel spring isolators with independent seismic restraints.
2. Spring mounts shall have bolt down base plates and 3/4-inch-thick neoprene pads. Spring hangers are to incorporate springs in series with a minimum 1-inch-thick neoprene element.
3. Acceptable Manufacturers: 1-Mason Industries (714-535-2727); 2-Kinetics Noise Control (614-889-0480); and 3-M.W. SaussÈ & Co. (Vibrex 805-257-3311).

Description	1	2	3
Unhoused spring and slack cable restraint*	SLFH	FDS-B	RMS, RMSG
vertical limit stop *	SLR (100 Series)	FLS	RMLS-EQ
Independent Seismic Restraints	Z-1225	KSS	SR 3500
Spring hanger	30N	SRH	HXA
Captive Neoprene Mounts	BR	--	FUD-EQ

\* Include resilient pad(s) to achieve an overall thickness of 3/4 inch, minimum, and bolt down bottom plates.

### Vibration Isolation Types and Deflection

(Unless Otherwise Scheduled on the Drawings)

Equipment	Deflection
Roof-mounted Heat Pump	1-inch
Energy Recovery Units	1-inch

Note: The minimum required vibration isolator deflection is 12 times the static deflection of the supporting structure caused by the additional equipment load, or as indicated above, whichever is greater.





4. Provide the following clearances:
  - a. 10-foot minimum between all rotating equipment and spaces having NC 30 noise criteria
  - b. 15 inches above equipment attached with spring hangers
  - c. 2 inches clear under vibration-isolated equipment.

### **Pipe Hangers, Supports, And Penetrations**

1. Size incoming water lines for flow rates of 6-feet-per-second maximum in the branch lines.
2. Regulate incoming water pressure to 50 psig.
3. Provide water hammer shock arrestors near the end of water branch lines.
4. Isolate pipes three-inch diameter and greater attached to the inlet and discharge of prime movers and pressure-reducing valves using spring isolators (e.g., Mason 30N) having 1-inch static deflection for the first five points of support.
5. Isolate the remainder of pipes 3-inch diameter and greater using deflected neoprene isolators (e.g., Mason BR, HD or ADA) having a static deflection of 0.35 inches. Use resilient pads (e.g., Mason SWM) under pipe elbows supported from the floor.
6. Isolate all piping in insulated wall & ceiling constructions as follows:
7. Piping less than 1-inch in diameter use Technical Specialties Acousto Plumb attachments. See Figures A and B
8. Piping larger than 1-inch in diameter use Elmdor Trisolators series 100/500 or equivalent. See Figure C
9. Provide refrigerant piping isolation using AcoustoPlumb, Trisolator series 100/500 or Hydracraft Acoustaclamps.
10. Waste pipes and rainwater leaders in sound-rated spaces (spaces with ratings of NC 35 or less) are to be attached using Trisolator series 400 resilient attachments in horizontal isolator runs and in vertical runs use neoprene mounts (e.g., Mason BR or ND) underneath the supporting clamps. Use 3/4-inch-thick neoprene waffle pads (e.g., Mason SWM) under pipe elbows supported from the floor. See Figure D.
11. Do not allow piping to directly contact framing or gypsum board in sound rated construction. Provide a minimum 1-1/2-inch clearance between pipes and adjacent gypsum board surfaces. See Figures E and F.

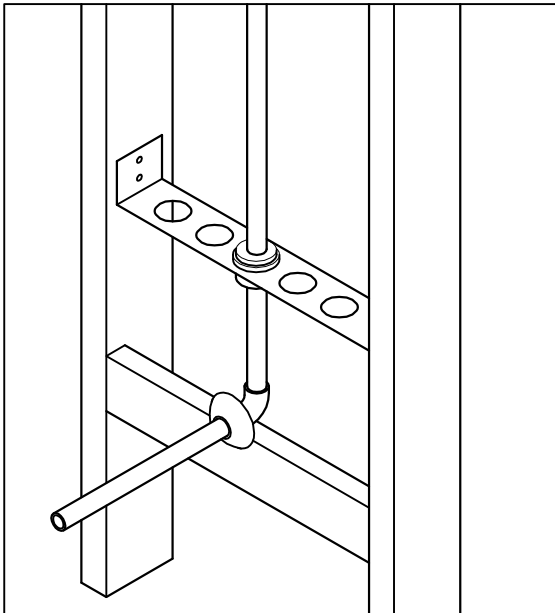
### **Sprinkler Piping**

1. Route all sprinkler piping mains to minimize penetration of sound-rated constructions.

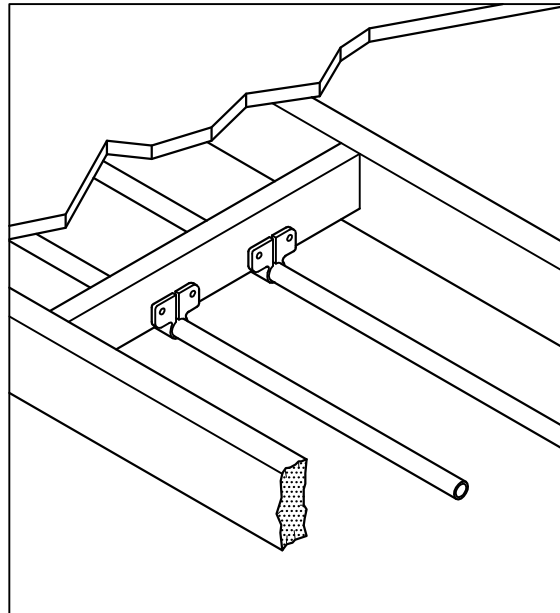


2. Provide a single sprinkler pipe branch into each sound sensitive space.

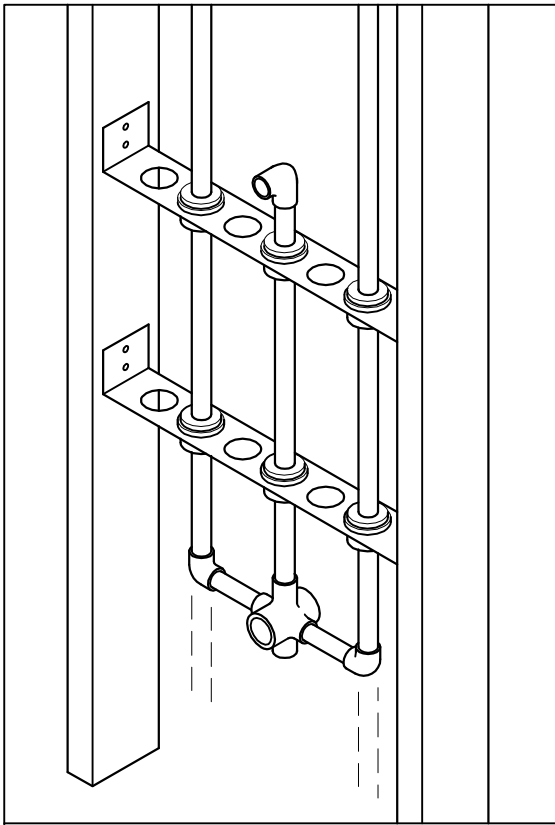




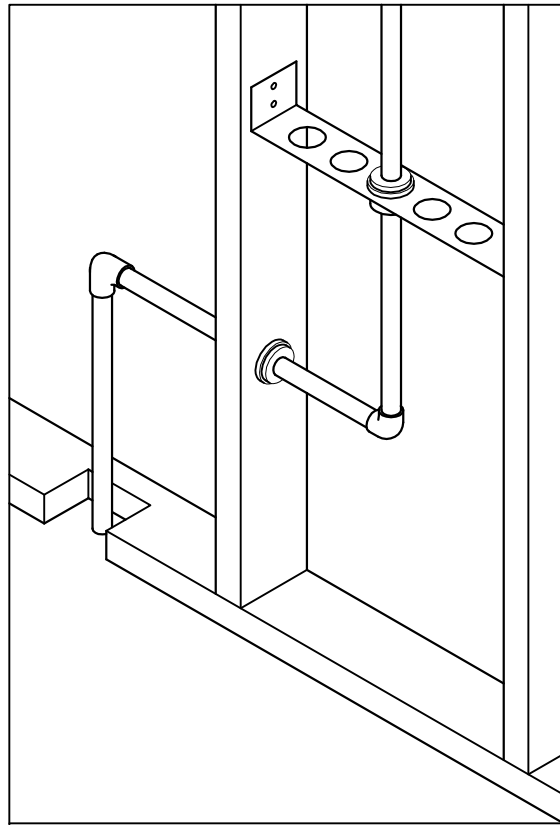
WALL PENETRATION INSTALLATION



JOIST BAY INSTALLATION



TUB/SHOWER VALVE INSTALLATION



VERTICAL STUD BAY INSTALLATION

NOTE: LOCATE PIPING 1 1/2" MIN.  
CLEARANCE OF GYPSUM BOARD

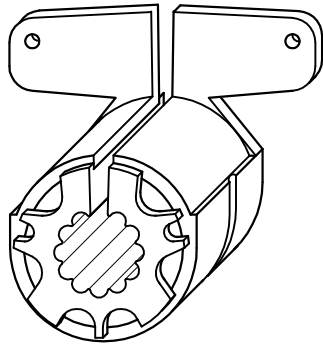
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FOR ACOUSTICAL DESIGN INFORMATION ONLY

# ACOUSTO-PLUMB SYSTEM INSTALLATION EXAMPLES

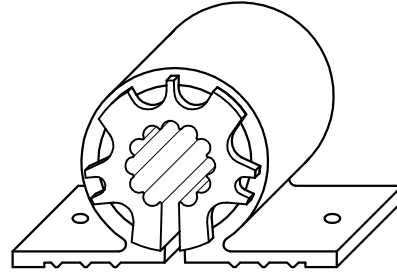
## FIGURE A

1596  
3.1.1

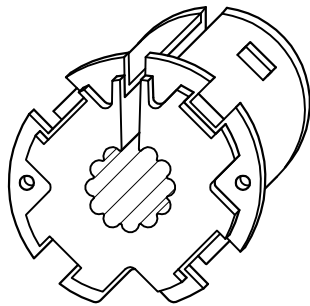
HSG  
02.04.04



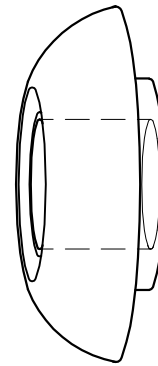
HIGH EAR  
ACOUSTO-CLAMP



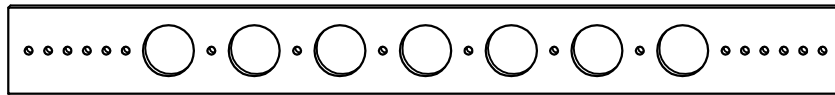
ACOUSTO-CLAMP



ACOUSTO-LATOR



ACOUSTO-SCUTCHEON



METAL BRACKET  
(SIZES VARY: COMES IN ACOUSTO-KIT  
WITH TWO ACOUSTO-LATORS)

ACOUSTO-PLUMB SYSTEM COMPONENTS  
ARE AVAILABLE THROUGH LSP/SPECIALTY PRODUCTS  
(800)854-3215

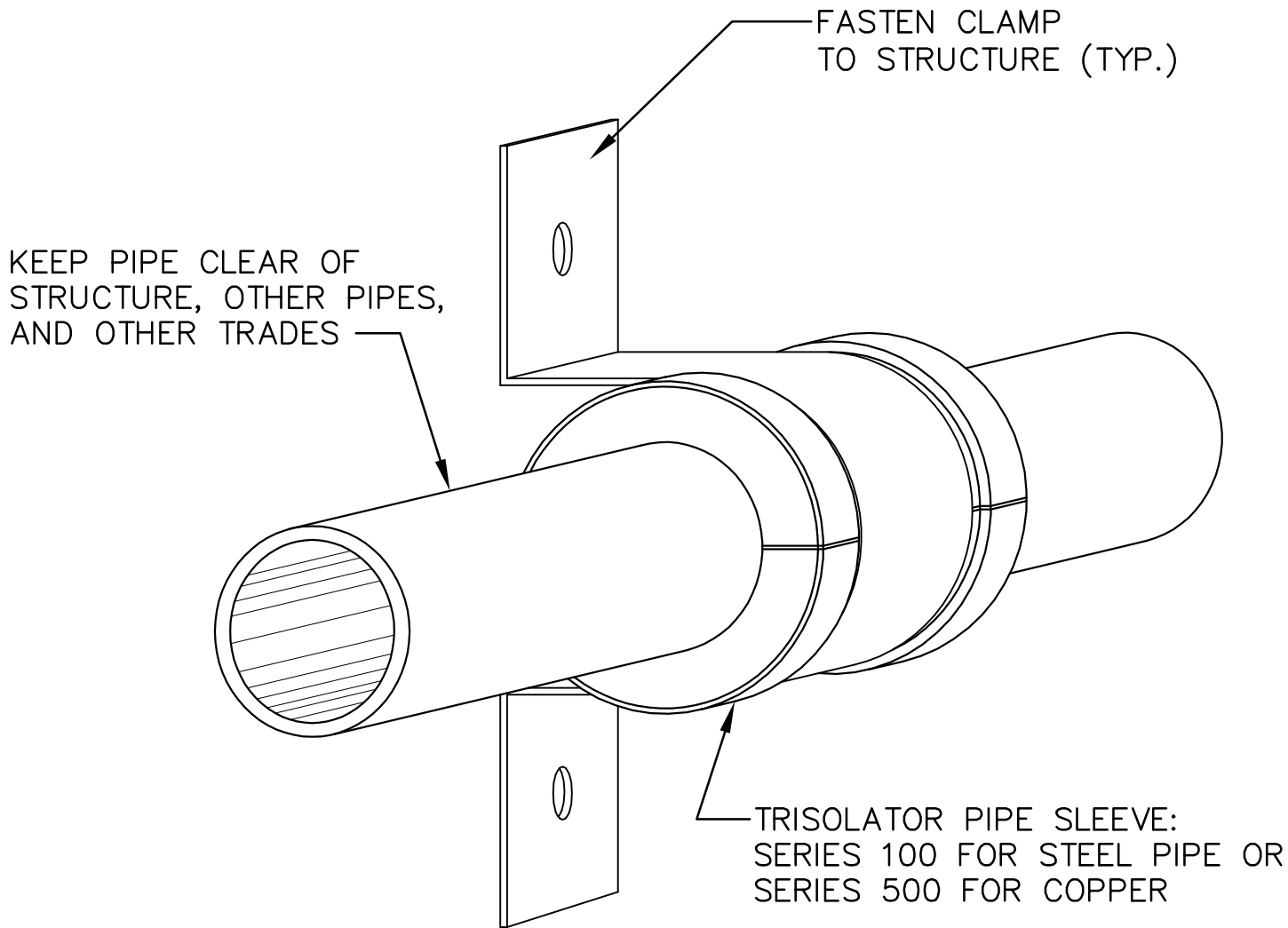
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ACOUSTO-PLUMB SYSTEM  
COMPONENTS

FIGURE B

1595  
3.1.1

AGA  
02.04.04



TRISOLATOR AVAILABLE THROUGH:  
 ELMENDOR/STONEMAN ENGINEERING  
 (800) 591-9181

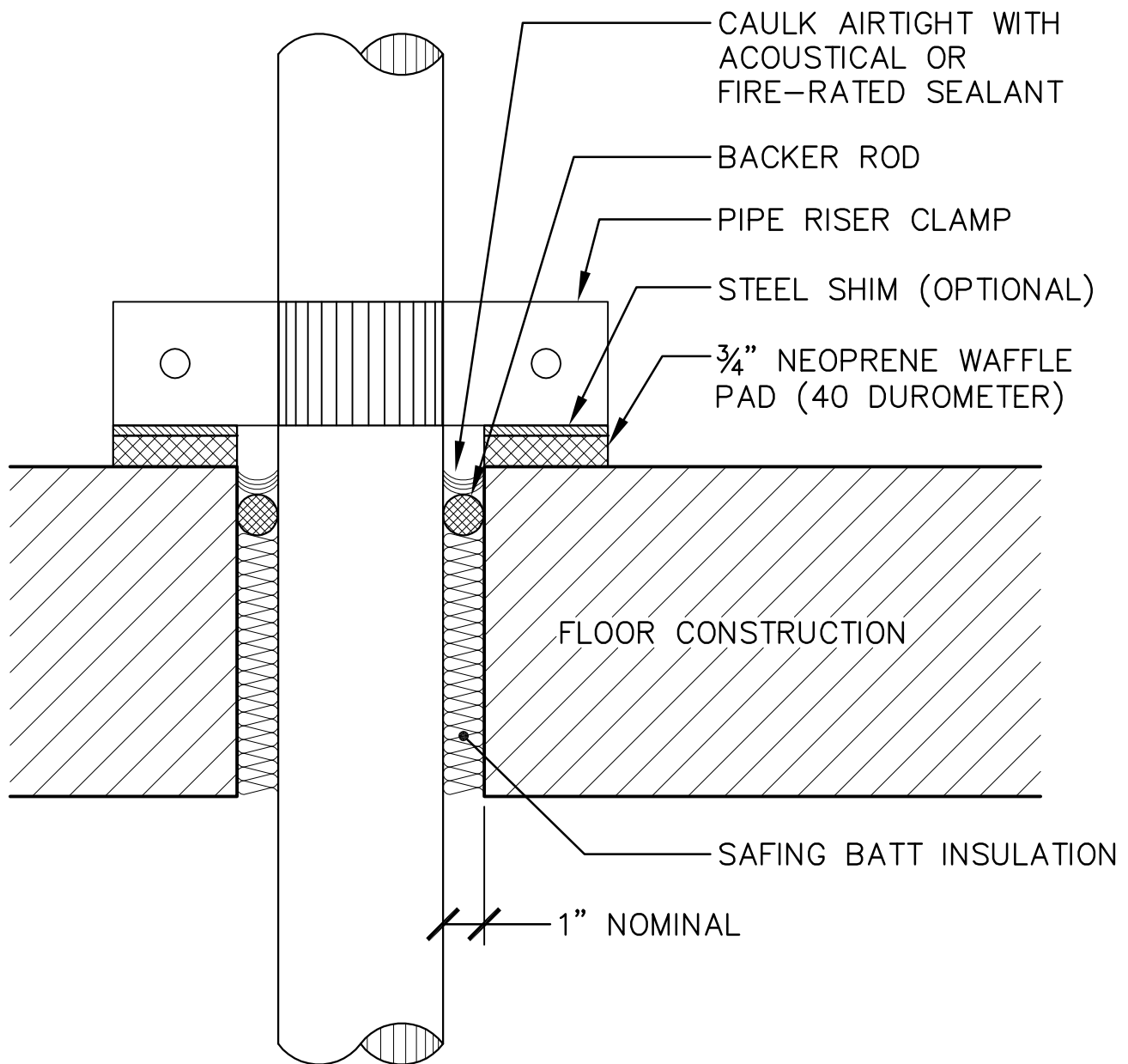
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ATTACHMENT OF PLUMBING  
 PIPES GREATER THAN  
 1-1/4 INCH DIAMETER

FIGURE C

1125  
 3.1.1

TMD  
 02.04.04



NOTE: LOCATE PIPING 1 1/2" MIN. CLEARANCE OF GYPSUM BOARD

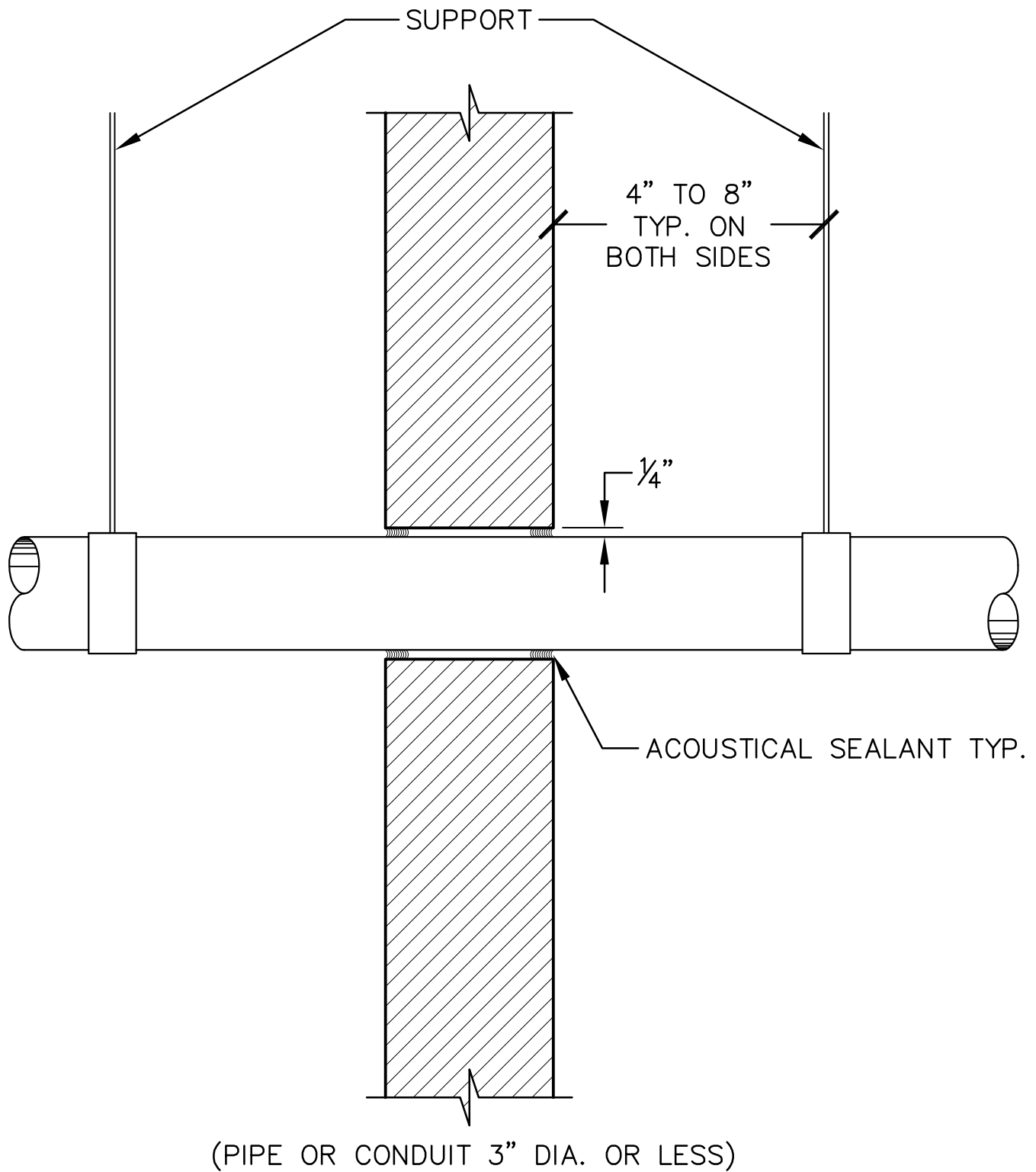
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PIPE ISOLATION AT FLOOR  
 FOR WASTE PIPES AND  
 RAIN LEADERS

FIGURE D

1654  
 3.1.1

DRS  
 10.31.02



NOTE: APPLICABLE AT ALL SOUND-RATED CONSTRUCTION INCLUDING INTERIOR INSULATED ASSEMBLIES.

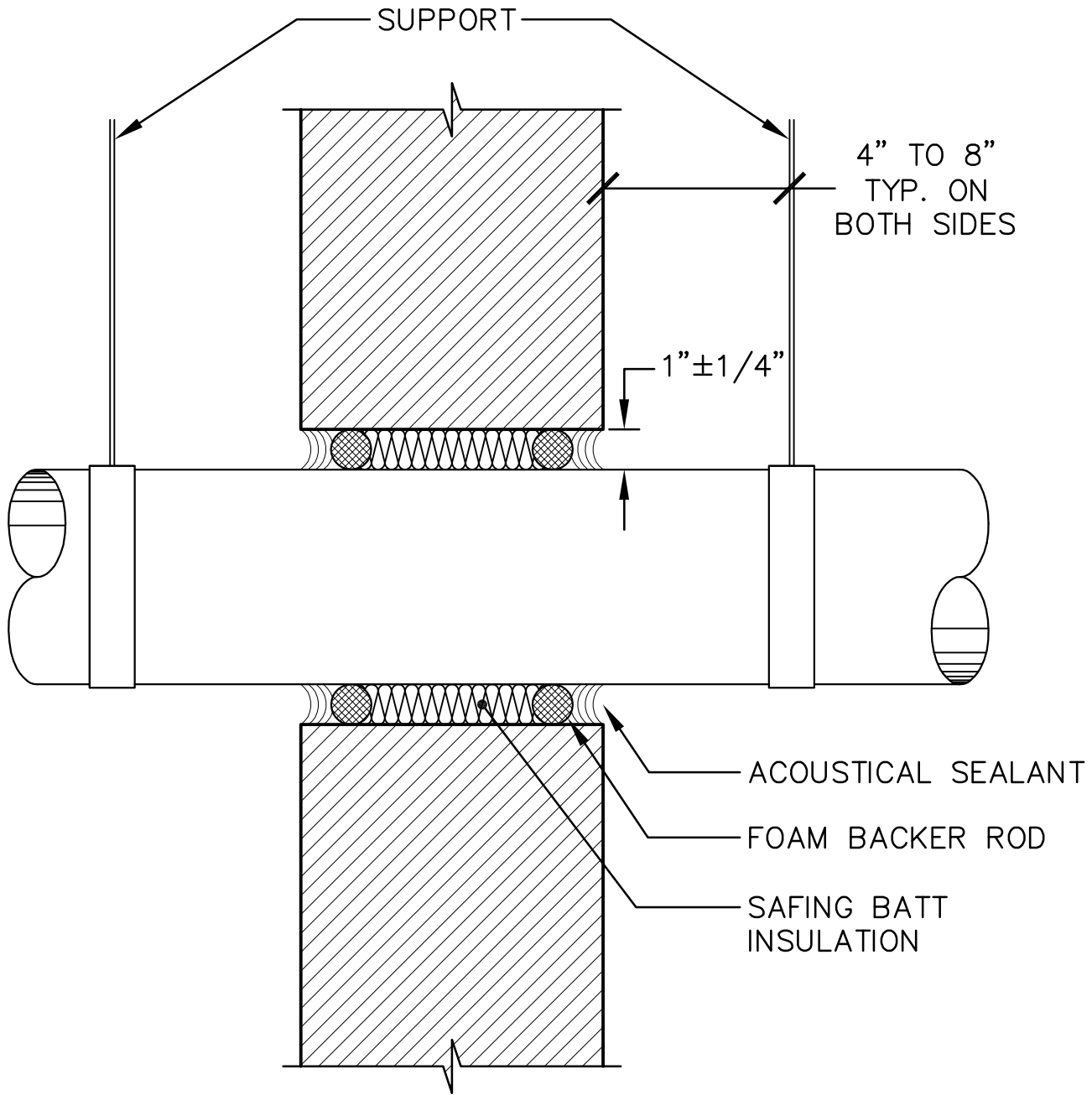
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TYPICAL PIPE OR CONDUIT  
 PENETRATION THROUGH  
 SOUND-RATED CONSTRUCTION

FIGURE E

182  
 3.1.1, 3.1.3

DRS  
 10.31.02



(DUCT, PIPE OR CONDUIT 3" DIA. OR GREATER)

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TYPICAL DUCT, PIPE, OR  
 CONDUIT PENETRATION THROUGH  
 SOUND-RATED CONSTRUCTION

FIGURE F

181  
 3.1.1, 3.1.3

DRS  
 10.31.02



**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX F**  
**OWNER'S PROJECT REQUIREMENTS**

# Willard Park Clubhouse

Berkeley, CA

## Owner's Project Requirements

April 25, 2023

PREPARED FOR:

**City of Berkeley**

PREPARED BY:



Red Car Analytics  
4460 Chico Ave.  
Santa Rosa, CA 95407  
[solutions@redcaranalytics.com](mailto:solutions@redcaranalytics.com)

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**Document history:**

<i><b>Document Version</b></i>	<i><b>Reason for change</b></i>	<i><b>Effective from</b></i>
1.0	First draft	12/16/2022
2.0	Updates from owner on city requirements	01/15/2023
3.0	Updates from owner	04/26/2023

# 1 Overview

The purpose of this document is to provide the Owner’s goals, expectations, performance criteria, success criteria and requirements for the facility. It shall be used throughout the project delivery and commissioning process to provide an informed baseline and focus for design development and for validating building energy and environmental performance.

The Owner’s Project Requirements (OPR) is a required document for LEED Fundamental & California T24 Energy Code Part 6 120.8.

## 1.1 General Description

The City of Berkeley California is building a new clubhouse at Willard Park. The clubhouse will include two community rooms, a lobby, an office, kitchenette, restrooms, storage, and custodian spaces. An all-electric, Zero Net Energy is a major goal for the project. Water resource resiliency has also been identified as a goal for the project.

Table 1 shows a summary of basic project characteristics.

**Table 1: Project Description**

<b>Building Type</b>	<i>Clubhouse</i>
<b>No. of Buildings</b>	<i>1</i>
<b>Levels</b>	<i>1</i>
<b>Space Types</b>	<i>Community Rooms Lobby Office Kitchenette Restrooms Storage Custodian spaces</i>
<b>Floor Area</b>	<i>3285 sq. ft.</i>
<b>Location</b>	<i>Berkeley, California</i>

Table 2 shows the anticipated occupancy and operational schedule for the building.

**Table 2: Anticipated Occupancy Schedule**

Space type	Weekdays			Weekends & Holidays
	Typical Occupancy Schedule	HVAC Occupancy Schedule	Lighting/ Plug Load Occupancy Schedule	
<i>Community Rooms</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>Rentals (8am – 6pm)</i>
<i>Lobby</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>Rentals (8am – 6pm)</i>
<i>Office</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>Rentals (8am – 6pm)</i>
<i>Kitchenette</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>Rentals (8am – 6pm)</i>
<i>Restrooms</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>1-6pm</i>	<i>Rentals (8am – 6pm)</i>

## 1.2 Reference Documents

The following documents are requirements of the City of Berkeley and are provided as reference for use on this project:

- City of Berkeley Resolution 62284 – Green Building & LEED Requirements
- Energy and Water Standards for Municipal Facilities
- Natural Gas Infrastructure Prohibition in New Buildings – 7672 (002)
- City of Berkeley Resolution 51813- Local Business Preference Program for purchase of supplies
- City of Berkeley Resolution 62783 – Endorsing Kyoto Protocol for reduction of greenhouse emissions
- City of Berkeley Resolution 70171 – Transition from Fossil Fuel Economy
- Recycling and Composting Standards for Municipal Facilities
- City of Berkeley Resolution 58291 – Restriction of tropical hardwood products
- City of Berkeley Resolution 62849 – Zero Waste Goal

The following documents are considered reach goals for 2022:

- 2022 Building Code Adoption Ordinance Final1
- AB802-FactSheet; Benchmarking and Public Disclosure

## 1.3 Resiliency

Optimize use of on-site renewable energy.

Utilize local available building materials whenever possible.

## 1.4 Future Expansion Potential

There are no plans for future expansion at this facility.

## 1.5 Health and Wellness

The building will create a work environment that enhances the general health, fitness, and wellbeing of the occupants

Whenever possible, non-toxic caulks, paint, adhesives, sealants, and cleaning products shall be used.

Procedures during construction shall be implemented by the contractors to minimize construction-related contaminants in the building. These procedures include activities such as control of moisture, regular space-cleaning activities, and protection of delivered equipment and material before and after installation and HVAC startup.

## 1.6 Commissioning

### 1.6.1 General

The project will be commissioned in accordance with the following:

- Title 24-2019 Part 6 (California Energy Code) commissioning requirements
- 2019 CALGreen (California Green Building Code) commissioning requirements
- LEED v4.1 Fundamental and Enhanced (Optional) commissioning requirements

The following systems shall be commissioned:

- Heating, ventilating and air conditioning systems
- HVAC Controls
- Lighting and Lighting Controls
- Domestic Hot Water System
- Renewable Energy Systems

## 2 Sustainability & Energy Efficiency Goals

### 2.1 Energy Targets

This project has the following energy targets.

**Table 3: Summary of Sustainability & Energy Targets**

Category	Baseline	Design Target	Stretch Target
<i>Zero Net Energy</i>			
<i>Energy Use Index (EUI)</i>		<i>26.2 kBtu/sf/yr</i>	<i>19.3 kBtu/sf/yr</i>

### 2.2 Sustainability Targets

The project goals are as follows:

1. LEED™ f V4.0 Silver
2. All-Electric
3. Zero Net Energy

### 2.3 Water Goals

- Plumbing design should focus on reducing domestic water consumption and the total energy associated with the plumbing equipment including the domestic hot water (DHW) generation.
- Low flow fixtures shall be used.
- Both rainwater harvesting and greywater reuse systems should be considered for this project.
- See plumbing Section 4.6 for additional requirements.



## 2.4 Waste Goals

- City of Berkeley has a stretch goal of zero waste (materials sent to landfills)
- Each city facility is expected to establish and maintain a recycling program.
- If facility is comprised of 10% or more compostable material (food/plant debris), then compost collection must be established.
- Establish common-area waste containers and signate in kitchen areas for trash, container recycling, paper recycling, and where applicable compost.
- Blue paper recycling container at points of paper generation like copy rooms.
- Small blue recycling containers are required at each workstation. Recycling containers should not be lined.
- Individual workstation trash cans are discouraged. Instead staff should take trash and recyclable containers and compostables to the common-area waste containers.

## 3 Performance Criteria

### 3.1 Enclosure Requirements

- Optimize window to wall ratio to ensure enough glazing is provided for good daylighting performance while limiting impact on heating and cooling loads.
- Good glass and reduce thermal bridging at connections
- Use of low solar gain glazing units
- Maximum SHGC of .3 or .23 for clear glass

### 3.2 Quality Requirements for Materials and Construction

Construction materials selected for the project should be based on long term serviceability, environmental and sustainability goals.

### 3.3 Acoustical Requirements

The acoustic design for the project will address the following:

- Interior acoustic quality – room acoustic performance shall reduce reverberant noise and support intelligible speech communication in gathering and offices spaces
- Sound Containment/Isolation – Demising separations (e.g. façade walls, doors) that manage the transmission of noise and acoustic privacy between noise critical spaces
- Noise & Vibration Control – Design needs to meet neutral background noise targets from HVAC equipment based on activity and usage.

The acoustic targets for the project shall be based on:

- LEED v4.1 Interior Environmental Quality: Acoustic for Commercial Interiors
- ASHRAE 2019 Handbook: HVAC Applications
- Industry Standard Best Practices

### 3.4 Vibration Requirements

Prevent occupants adjacent to HVAC equipment and corridors from sensing vibrations from structural deflection as a result of occupant traffic, and equipment operation.

### 3.5 Seismic Requirements

Comply with local code requirements.

### 3.6 Accessibility Requirements

The building shall be evaluated as to the implications of meeting all Federal, State and Local ADA requirements.

Systems requiring routine maintenance, such as HVAC, shall be designed to provide adequate access and clearance for all maintenance tasks (i.e., AHU Filter access, sufficient space to pull coils, light bulbs, battery replacement for emergency fixtures, etc.)

### 3.7 Communication Requirements

Telephone and CATV services are derived from the overhead utility pole.

An audio-visual system is required for the community room. Anticipate 6 data drops.

The offices should also have data drops. Anticipate 2 data drops.

### 3.8 Air Quality, Ventilation & Filtration Requirements

#### 3.8.1 Outside Air Monitoring & Control

HVAC systems should be designed to allow comfortable indoor air quality while maximizing energy efficiency.

Design team to maximize natural ventilation as much as possible.

#### 3.8.2 Filtration

Each ventilation system that supplies outdoor air to occupied spaces must have particle filters or air-cleaning devices with Minimum efficiency reporting value (MERV) of 13 or higher. Replace all air filtration media after completion of construction and before occupancy.

### 3.9 Temperature & Humidity Control

Target indoor air conditions are as follows.

**Table 4: Summary of Target Indoor Air Conditions**

Space Type	Occupied Hours			Unoccupied Hours	
	Space Temperature Setpoint Range Summer	Space Temperature Setpoint Range Winter	Relative Humidity Target Range	Space Temperature Setpoint Range	Relative Humidity Target Range
Community Rooms	78°F	68°F +/- 2	N/A	60°F – 82°F	N/A
Lobby	78°F	68°F +/- 2	N/A	60°F – 82°F	N/A
Office	78°F	68°F +/- 2	N/A	60°F – 82°F	N/A
Kitchenette	78°F	68°F +/- 2	N/A	60°F – 82°F	N/A
Restrooms					
Storage	78°F	68°F +/- 2	N/A	60°F – 82°F	N/A
Custodian Spaces	78°F	68°F +/- 2	N/A	60°F – 82°F	N/A

## 3.10 Lighting

### 3.10.1 Interior Lighting

The space will take advantage of daylighting wherever possible.

Accessibility to battery backup for replacement at the fixtures is required.

Lighting system shall be capable of providing 30 fc at the desk level.

If task lighting is selected this requirement can be reduced. Task lighting would be put on controlled receptacles, which would automatically turn off task light when occupant leaves workstation.

### 3.10.2 Exterior Lighting

Exterior lighting is to meet the minimum exiting requirements while minimizing energy use.

Nighttime illumination will be provided for both general site navigation as well as for security.

## 4 Equipment & System Expectations

### 4.1 Building Envelope

Include passive house design principles where possible.

### 4.2 Mechanical Systems

Mechanical systems will be selected to meet the design goals outlined in Section 2\_ Sustainability and Energy Efficiency Goals. Specific requirements for individual systems are provided below.

The proposed systems shall have a “light touch” approach and will follow the existing building strategy, utilizing natural ventilation and hydronic heating where possible and serving the main spaces with larger mechanical equipment. The services will make use of the existing main distribution pathways and work with the existing architectural elements to create a holistic solution that is sensitive to the historic nature of the building.

The mechanical systems shall be designed to provide a comfortable, healthy, environment with low energy cost and minimal architectural impact.

### 4.3 Lighting System & Controls

Lighting systems will be selected to meet the design goals outlined in Section 2\_ Sustainability and Energy Efficiency Goals. Specific requirements for individual systems are provided below.

Electric lighting shall be designed to decrease energy use while creating a comfortable visual environment for the users.

Use of high efficiency light sources and light fixtures wherever possible.

Provide automatic lighting controls to turn off lights when space is vacant.

Provide daylight into spaces to provide usable light during daylight hours.

### 4.3.1 Lighting System

Illumination selections shall adhere to the following:

- High efficacy fixtures
- Use 0-10v continuous dimming controls
- Reduced maintenance cost (lamp life 50,000 to 100,000 hours)
- Provide 30 fc at the desk level

### 4.3.2 Lighting Controls

Illumination selections shall adhere to the following:

The lighting control system shall meet the requirements of 2019 Building Energy Efficiency Standards (T24) and provide appropriate controls and flexibility for the intended use of the space. It is proposed to use a 0-10V building wide control system as the basis of design.

Multi-level or dimmable lighting controls is desired for most of the areas with new lighting installation to accommodate the individual needs and preferences of the staff.

Controls should correspond to time of day and provide maximum energy savings.

## 4.4 Building Automation System

### 4.4.1 HVAC Automation

Provide a complete Building Automation System (BAS) that will provide automatic control and monitoring of MEP equipment. All analog and digital points shall be monitored and able to be trended without changing BAS programming. BAS shall be capable of communicating with other controls systems in the building (such as lighting and security). The control system selected should be consistent with other City of Berkeley BAS systems.

## 4.5 Plumbing System

### 4.5.1 Plumbing Fixtures

Existing restroom will require renovation. Plumbing fixtures shall be low flow to meet or exceed LEED recommendations.

Meet the following flush and flow rates:

- Water closets – 1.28 gpf
- Lavatory faucets – 0.5 gpm
- Lavatory faucets (metered) - .2 gpc
- Kitchen/Hand Sinks – 1.8 gpm

### 4.5.2 Domestic Hot Water

Domestic hot water should be provided to the main community room sinks, kitchen sink, restroom sinks, and janitors mop sink. The remote restroom should also provide hot water to the lavatories. The overall goal of the hot water system is to provide adequate hot water at a minimized demand for energy.

The project would like to use an efficient electric hot water heater.

## 4.6 Landscape and Irrigation System

Currently there is no scope of work for irrigation design.

## 4.7 Electrical System

This project shall implement a sensible and sustainable electrical system that provides ease of maintenance, flexibility and capacity for future modifications.

The building will require a new electrical service.

### 4.7.1 Emergency System

Emergency source of power shall be provided for the building for the following loads:

- Emergency and Egress Lighting
- Exit signs
- Fire Alarm

### 4.7.2 Distribution Service

Distribution system and feeder capacity will be designed in accordance with the California Electrical Code.

## 4.8 Renewable Energy Systems

The building shall have the following renewable energy systems:

### 4.8.1 Solar PV System

- The PV system should be on the roof the clubhouse.
- The PV system should be designed to achieve Zero Net Energy for the building's annual energy usage.
- The PV system shall have a monitoring system to observe the performance of the system.

### 4.8.2 Battery Storage System

- The Battery Storage system should be designed to support the entire building for a minimum of 12 hours after the utility power outage occurs.
- The Battery Storage system shall also allow for the PV system to remain operational in the event of a power outage.

# 5 Occupant and O&M Personnel Requirements

## 5.1 Operation and Maintenance Requirements

### 5.1.1 Training Requirements

Training shall include an overview of system components and descriptions, equipment locations and functions, safety provisions, normal operating and energy conservation techniques, BAS, and overall system design intent.

All training shall be videotaped for future reference.

### 5.1.2 Maintainability

Equipment arrangements shall allow for all maintenance access requirements, filter access, tube & coil removal space, lay down areas, and any other clearances necessary for safe operation, maintenance, and repair of all equipment to be provided.

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX G  
LEED SCORECARD**

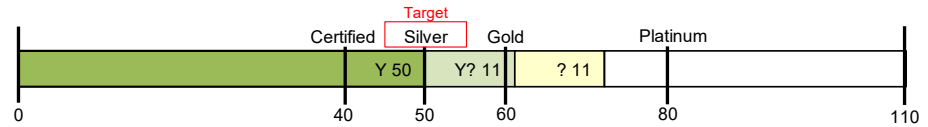


# LEED SCORECARD SUMMARY

## Willard Clubhouse

BD+C New Construction v4

9/18/2023



50	11	11	37	TOTAL	110 Pts								
Y	Y?	?	N		D/C	EP	RP						
1				<b>INTEGRATED PROCESS</b>	1 Pts								
1				IPc1: Integrated Process	1	D							
10			6	<b>LOCATION AND TRANSPORTATION</b>	16 Pts								
			16	LTc1: LEED For Neighborhood Development Location	16	D							
1				LTc2: Sensitive Land Protection	1	D							
			2	LTc3: High-Priority Site	2	D							
5				LTc4: Surrounding Density and Diverse Uses	5	D							
3			2	LTc5: Access to Quality Transit	5	D							
			1	LTc6: Bicycle Facilities	1	D							
1				LTc7: Reduced Parking Footprint	1	D							
			1	LTc8: Green Vehicles	1	D							
2	4		4	<b>SUSTAINABLE SITES</b>	10 Pts								
				<b>Required</b>									
1				SSp1: Construction Activity Pollution Prevention									C
				SSc1: Site Assessment	1	D							
	1		1	SSc2: Site Development - Protect or Restore Habitat	2	D							
	1			SSc3: Open Space	1	D							
			3	SSc4: Rainwater Management	3	D							
	2			SSc5: Heat Island Reduction	2	D							
1				SSc6: Light Pollution Reduction	1								
	1		9	<b>WATER EFFICIENCY</b>	11 Pts								
				<b>Required</b>									
				WEp1: Outdoor Water Use Reduction									D
				<b>Required</b>									
				WEp2: Indoor Water Use Reduction									D
				<b>Required</b>									
				WEp3: Building-Level Water Metering									D
	1		1	WEc1: Outdoor Water Use Reduction	2	D							
			5	WEc2: Indoor Water Use Reduction	6	D							
			2	WEc3: Cooling Tower Water Use	2	D							
			1	WEc4: Water Metering	1	D							
23	1	4	5	<b>ENERGY AND ATMOSPHERE</b>	33 Pts								
				<b>Required</b>									
				EAp1: Fundamental Commissioning & Verification									C
				<b>Required</b>									
				EAp2: Minimum Energy Performance									D
				<b>Required</b>									
				EAp3: Building-Level Energy Metering									D
				<b>Required</b>									
				EAp4: Fundamental Refrigerant Management									D
		4	2	EAc1: Enhanced Commissioning	6	C							
18				EAc2: Optimize Energy Performance	18	D							
			1	EAc3: Advanced Energy Metering	1	D							
			2	EAc4: Demand Response	2	C							
3				EAc5: Renewable Energy Production	3	D							
	1			EAc6: Enhanced Refrigerant Management	1	D							
2				EAc7: Green Power and Carbon Offsets	2	C							
4	2	7		<b>MATERIALS AND RESOURCES</b>	13 Pts								
				<b>Required</b>									
				MRp1: Storage and Collection of Recyclables									D
				<b>Required</b>									
				MRp2: Construction and Demolition Waste Management Planning									C
			5	MRc1: Building Life-Cycle Impact Reduction	5	D							
1		1		MRc2: Bldg Product Disclosure & Optimization - EPDs	2	C							
		1	1	MRc3: Bldg Product Disclosure & Optimization - Sourcing of Raw Mat.	2	C							
1			1	MRc4: Bldg Product Disclosure & Optimization - Material Ingredients	2	C							
2				MRc5: Construction and Demolition Waste Management	2	C							
5	3	5	3	<b>INDOOR ENVIRONMENTAL QUALITY</b>	16 Pts								
				<b>Required</b>									
				EQp1: Minimum Indoor Air Quality Performance									D
				<b>Required</b>									
				EQp2: Environmental Tobacco Smoke Control									D
1		1		EQc1: Enhanced Indoor Air Quality Strategies	2	D							
2		1		EQc2: Low-Emitting Materials	3	C							
1				EQc3: Construction Indoor Air Quality Management Plan	1	C							
		1	1	EQc4: Indoor Air Quality Assessment	2	C							
1				EQc5: Thermal Comfort	1	D							
		1	1	EQc6: Interior Lighting	2	D							
		1	2	EQc7: Daylight	3	D							
		1		EQc8: Quality Views	1	D							
			1	EQc9: Acoustic Performance	1	D							
4	1		1	<b>INNOVATION IN DESIGN</b>	6 Pts								
				<b>Required</b>									
				IDc1.1: Bird Collision Deterrence	1	D							
				<b>Required</b>									
				IDc1.2: Greenbuilding Education	1	D							
1				IDc1.3: Purchasing Lamps	1	D							
1				IDc1.4: Exemplary Performance EAc2	1	D							
1				IDc1.5: Exemplary Performance EAc5	1	D							
			1	IDc1.6: TBD (e.g. verified C&D Recycling Facility, O+M Started kit, etc)	1	D							
			1	IDc1.7: TBD	1	D							
			1	IDc1.8: TBD	1	D							
			1	IDc1.9: TBD	1	D							
			1	IDc1.10: TBD	1	D							
1				IDc2: LEED® Accredited Professional	1	C							
1	1		2	<b>REGIONAL PRIORITY</b>	4 Pts								
1				EAc2 Optimize Energy Performance (10 points)	1	D							
		1		MRc3 BPDO Sourcing of Raw Materials (1 point)	1	D							
			1	SSc4 Rainwater Management (3 points)	1	D							
			1	WEc2 Indoor Water Use Reduction (4 points)	1	D							
			1	LTc5 Access to Quality Transit (5 points)	1	D							
			1	MRc1 Building Life-cycle Impact Reduction (3 points)	1	D							



**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX H  
EBMUD FLOW AND PRESSURE  
RESULTS**

**EBMUD FIRE SERVICE AVAILABLE FLOW & PRESSURE INFORMATION**

---

**Contact Information:**

Frederick Ferris  
2180 Milvia Street  
Berkeley, 94704

**Request Number: 8247**

**E-mail:** srutherford@berkeleyca.gov  
**Phone:** 510-981-6738  
**Cell:**  
**Fax:**

**Property Information:**

2720 Hillegass Avenue  
BERKELEY, 94705

**Approximate Elevation (feet):** 245  
**Connection Size (inches):** 4  
**Design Flow if available (gpm):** 1000  
**Assessor's Parcel Number:** 54-1711-27

The following available flow and pressure information is based on a Maximum Day Demand Hydraulic Model Analysis of EBMUD's water distribution system. This information should be used as a guideline of the approximate available flow. It is recommended that a design allowance be made for possible reductions in pressure and/or flow that could occur under other possible scenarios. Applicant understands that the District cannot guarantee any specific values for pressure and flow. If you have any questions, please contact us at nbo@ebmud.com or call (510)287-1008.

**Available flow and pressure at possible fire service connection for above property:****Possible Fire Service Connection #1**

Located off of the 8-inch main (8C25) in Hillegass Avenue, on the west side of Hillegass Avenue, approximately 400 feet south of Derby Street.

**Pressure Zone:** Berryman  
**Connection Point Elevation (feet):** 251  
**Connection Point Static Pressure (psi):** 103  
**Residual Pressure at 1000 gpm (psi):** 101  
**Residual Pressure at 0 gpm (psi):** 103  
**Residual Pressure at 750 gpm (psi):** 102  
**Residual Pressure at 1500 gpm (psi):** 98

**Possible Fire Service Connection #2**

**Pressure Zone:** Berryman  
**Connection Point Elevation (feet):**  
**Connection Point Static Pressure (psi):**  
**Residual Pressure at 1000 gpm (psi):**  
**Residual Pressure at 0 gpm (psi):**  
**Residual Pressure at 750 gpm (psi):**  
**Residual Pressure at 1500 gpm (psi):**

**Possible Fire Service Connection #3**

**Pressure Zone:** Berryman  
**Connection Point Elevation (feet):**  
**Connection Point Static Pressure (psi):**  
**Residual Pressure at 1000 gpm (psi):**  
**Residual Pressure at 0 gpm (psi):**  
**Residual Pressure at 750 gpm (psi):**  
**Residual Pressure at 1500 gpm (psi):**

**Engineer's Comments:** The pressure and flow information stated is available at the street main connection in Hillegass Avenue.

Flow and pressure data is valid for one year after the approval date. You will need to submit a new request and pay applicable fee after the expiration date.

**NBO: MBURNS Engineer: VCHI Supervisor: JMC GREGO Date: 2023-09-29 14:50:27.0**

**STATEMENT OF DESIGN CRITERIA USED FOR FIRE SPRINKLER DESIGN**

---

**Request Number: 8247**

I, \_\_\_\_\_, designer of the fire sprinkler system located at the property address referenced on the above Request Number, used the following flow information to design the fire sprinkler system:

Static Pressure (psi): \_\_\_\_\_

Flow (gpm): \_\_\_\_\_

Residual Pressure (psi): \_\_\_\_\_

Maximum total fire flow requirement (gpm): \_\_\_\_\_

The fire sprinkler design or underground fire plan has been approved by the \_\_\_\_\_ (Fire Agency with Jurisdiction) Fire Marshal, and a copy of the signed and approved plan is attached.

The fire sprinkler design complies with EBMUD's standard backflow requirements, as described in the Private Fire Service pamphlet.

Please choose the service size from the list of Standard Fire Service Sizes shown below:

- 1-1/2 inch, maximum 100 GPM
- 2 inch, maximum 160 GPM
- 4 inch, maximum 600 GPM
- 6 inch, maximum 1350 GPM
- 8 inch, maximum 2340 GPM
- 10 inch, maximum 4400 GPM
- 12 inch, case-by-case

**NOTE: Service size chosen above must match size shown on plans.**

---

*Fire Sprinkler Designer Signature and Date*

Please return a copy of EBMUD's Fire Service Available Flow And Pressure Information results with the signed Statement of Design Criteria Used For Fire Sprinkler Design form when applying for a fire service.

---

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX I  
PRE-DEMOLITION SURVEY  
REPORT**



**ACUMEN**

INDUSTRIAL HYGIENE INC

1032 IRVING STREET #922 SAN FRANCISCO CA 94122

TEL 415 242 6060 FAX 415 242 6006

WWW.ACUMEN-IH.COM

## Pre-Demolition Survey Report

Asbestos, Lead, and Other Hazardous Building Materials Investigation

Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2023

Acumen Project No. COB 2335

*Prepared for:*

City of Berkeley  
Parks, Recreation & Waterfront Department  
1947 Center Street, 5th Floor  
Berkeley, CA 94704

*Prepared by:*

Tam Pham, CAC (June 29, 2023)  
Certified Asbestos Consultant #13-5033  
CDPH Lead Accredited #LRC-00004523

*Reviewed by:*

Paul M. Spillane, CIH, CAC (June 29, 2023)  
Certified Asbestos Consultant #10-4630  
CDPH Lead Accredited #LRC-00004523



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2720 Hillegass Avenue  
Berkeley, CA

June 2023\

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### APPENDICES

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## 1.0 Introduction

The purpose of this report is to present and discuss the findings of an asbestos, lead, and other hazardous building materials investigation that Acumen Industrial Hygiene, Inc. (Acumen) conducted for the City of Berkeley, the Client, at the Willard Clubhouse Recreation Center (Site). The Site is a one-story building with an adjacent public restroom located at 2720 Hillegass in Berkeley, California. Acumen's representative, Mr. Tam Pham, a registered California Asbestos Consultant (CAC) and Lead Inspector/Assessor (I/A), conducted this investigation on June 2, 2023.

We understand the purpose of this survey is for the structural demolition work that is scheduled to occur at the Site prior to redevelopment. At the time of the survey, the building was occupied. Our inspection was limited to accessible areas of the building. Destructive sampling of the building's roof was conducted during this investigation with assistance by Statewide Roofing, Inc. (San Jose, CA), who performed roof patching after the roof samples were collected.

The objectives of this investigation were as follows:

- To identify regulated asbestos containing materials (RACMs), defined by Bay Area Air Quality Management District (BAAQMD). RACMs and Category I and II materials that will be rendered friable need to be removed if they are to be impacted by building renovation and before the building can be demolished.
- To identify asbestos containing materials (ACM) that would require compliance with California Department of Industrial Relations – Division of Occupational Safety and Health (Cal/OSHA) asbestos regulations and waste disposal. ACM is a manufactured construction material with an asbestos content that is greater than 1% by weight.
- To identify asbestos containing construction materials (ACCM) that would require compliance with Cal/OSHA asbestos regulations. ACCM is a manufactured construction material with an asbestos content that is greater than 0.1% by weight.
- To identify primarily deteriorated lead-based paints (LBPs) that would need stabilization/removal before building demolition or renovation to comply with California Environmental Protection Agency (EPA) hazardous waste disposal regulations regulated by the California Department of Toxic Substances Control (DTSC). The handling of LBPs would also require compliance with Cal/OSHA lead regulations (8CCR1532.1). The evaluation of paints was not intended to be either a lead inspection or a lead hazard evaluation as defined by Title 17 CCR 35001 *et seq.* Lead-based paint inspections in public or residential buildings are subject to California Department of Public Health (CDPH) regulations.
- To identify lead-containing materials (LCMs) primarily in ceramic tiles that would need to be removed before demolition or renovation for compliance with Cal/OSHA and DTSC regulations. The evaluation was not intended to be either a lead inspection or a lead hazard evaluation as defined by California Department of Public Health (17CCR35001 *et seq.*)
- To visually identify other potential hazardous building materials that would require removal prior to demolition or renovation to comply with Cal-EPA DTSC hazardous waste disposal regulations. The handling of universal hazardous wastes also requires compliance with Cal/OSHA regulations. These universal hazardous wastes may include polychlorinated biphenyls (PCBs), mercury and Freon.
- Based on the age of the buildings (constructed or remodeled between 1950 and 1981), Acumen conducted representative sampling of "PCB priority building materials" consistent with the methods outlined in Protocol for Evaluating Priority PCBs-Containing Materials before Building

Demolition required by the Bay Area Stormwater Management Agencies Association (BASMAA, 2018). We included sampling for PCBs in “priority” building materials such as caulking, sealants, gaskets, mastics, thermal/fiberglass insulation and paints.

## **2.0 Summary of Investigation**

### ***2.1 Asbestos Survey Methods***

The asbestos inspection consisted of a walkthrough of the Site to identify and sample suspect ACM. Acumen noted significant factors of the suspect ACM, including the friability of suspect materials. Friability describes the ability of a material to be crushed or crumbled, when dry, into a powder using hand pressure.

Where suspect ACMs were noted, bulk samples were collected and submitted with our chain of custody forms to Micro Analytical Laboratories, Inc. (Emeryville, CA) for analysis. This laboratory is accredited by the National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP) for selected test methods for asbestos. This laboratory also holds certification from the American Industrial Hygiene Association (AIHA). The asbestos laboratory results are shown in Appendix A.

Acumen collected thirty (30) asbestos samples at the Site. The suspect asbestos samples collected were analyzed by polarized light microscopy (PLM). The asbestos laboratory reports are shown in Appendix A. This method identifies the type(s) of asbestos present in the sample and its corresponding percent concentration(s). The reliable limit of quantification of this method is 1% asbestos.

### ***2.2 Lead-Containing Materials and Paint Survey Methods***

The lead inspection consisted of a walkthrough of the Site to identify deteriorated surface coatings and suspect LCMs. Paints that were in deteriorated condition (peeling, chipping, powdering, etc.) and ceramic tiles were sampled, noting the location, color, substrate, and extent of deterioration. Intact paints were also sampled, for Cal/OSHA compliance purposes.

We collected four (4) discrete paint samples and one (1) paint bulk sample for lead analysis. The discrete paint samples were analyzed by flame atomic absorption (FLAA) spectrometry using Method 7420. The paint bulk sample was analyzed for total lead content by Total Threshold Limit Concentration (TTL) method, U.S. EPA Method SW-846. The limit of quantification depends on the mass of the sample. Lead bulk materials (ceramic tiles) were not observed during this investigation.

Lead paint samples were submitted to Micro Analytical Laboratories, Inc. (Emeryville, CA) for analysis. This laboratory is accredited by the AIHA under the Environmental Lead Laboratory Accreditation Program (ELLAP) for selected lead analysis methods. When a result is noted to be less than (<) on the lead sample report, it should be interpreted as meaning below analytical detection limit. The lead laboratory results are also shown in Appendix A.

### ***2.3 Other Hazardous Building Material Survey Methods***

During this inspection, we visually verified the presence of other suspect hazardous building materials. We also tallied fluorescent light tubes and estimated the number of ballasts associated with them. Ballasts were assumed to contain PCBs and not sampled. PCB presence can be verified at the time of demolition or renovation as non-PCB ballasts will be so labeled.



We collected four (4) PCB sample materials during our inspection. PCBs samples were analyzed using EPA Method 8082 by gas chromatography with electron capture detection (ECD). The PCB bulk samples were submitted to McCampbell Analytical, Inc. (Pittsburg, CA) for analysis. This laboratory is accredited by the AIHA under the National Environmental Laboratory Accreditation Program (NELAP) for selected lead analysis methods. The PCB laboratory results are also shown in Appendix A.

### **3.0 Narrative Summary of Findings**

The one-story building with adjacent public restroom was built slab-on grade with concrete and concrete masonry unit (CMU) perimeter walls (Photo 1). Interior finishes of the building consist of painted drywall with taping mud and painted plywood wall, which do not contain asbestos. We sampled the 12-inch vinyl floor tiles and its associated mastic and they were found not to contain asbestos. The spray applied acoustical texture over concrete ceiling was found to contain 25% asbestos. There is one sink that has 60% asbestos undercoating on it. Other suspect materials, which included cove base mastic, door gasket, paints and CMU mortar were sampled and they do not contain asbestos.

The main roof over the clubhouse consists of concrete slab over roofing materials which were core sampled and they were found not to contain asbestos. We were not able to core sample the roof located above the clubhouse's restroom due to accessibility and thus roofing materials at this area are assumed to contain asbestos until they can be sampled and proven otherwise. Intact paints were found to contain up to 15,000 parts per million (ppm) lead. There are fluorescent light fixtures, which are suspected to contain mercury (in the tubes), and possibly PCBs in their ballasts. This can be verified at time of abatement, prior to demolition or renovation.

### **4.0 Detailed Findings and Discussion**

#### ***4.1 Asbestos Findings and Discussion***

The sampling results for asbestos containing materials are summarized on Table 1. The estimated quantity is for asbestos containing materials that can be found throughout the buildings and is not limited to only where the materials were sampled. Table 2 shows the sample results for those materials that did not contain detectable amounts of asbestos. The laboratory analytical results are included in Appendix A. Asbestos sample locations are illustrated on the Sample Location Maps provided in Appendix B. The diagrams indicate where the samples were taken, but locations of these materials are not limited to the areas sampled. Representative photographs of materials that have been identified are provided in Appendix C.

##### ***4.1.1 Friable Asbestos Containing Materials***

During our investigation, we found friable asbestos containing material based on bulk samples collected at the building.

- Spray-on acoustical texture over concrete ceiling contains up to 25% chrysotile asbestos (samples COB2335-08A, COB2335-08B and COB2335-08C, Photo 2). There are approximately 450 square feet of this RACM present throughout the building. The removal of this material is considered Cal/OSHA Class I asbestos abatement.

##### ***4.1.2 Non-Friable Asbestos Containing Materials***

During our investigation, we found non-friable asbestos containing material based on bulk sample collected at the building.

- Sink under coating contains 60% asbestos (sample COB2335-10A, Photo 3). We found one (1) sink in the building. The removal of this Category I non-friable materials is considered Cal/OSHA Class II asbestos abatement.

#### **4.1.3 Assumed Asbestos Material (Not Sampled)**

During our investigation, there were assumed non-friable asbestos containing materials found at the Site where samples were not collected because the area is inaccessible and destructive sampling was not feasible. Assumed asbestos containing materials should be sampled prior to demolition to confirm that they do not contain asbestos.

- Suspect roofing materials over clubhouse restroom's roof are assumed (not sampled) to contain asbestos (Photo 4) unless bulk samples are taken to prove otherwise. These materials are considered Category I non-friable and require Cal/OSHA Class II abatement procedure if they were found to contain asbestos. Quantity is to be determined. These materials should be sampled prior to demolition.

#### **4.1.4 Regulated Asbestos Containing Materials**

BAAQMD regulates air emissions from building demolition and renovation projects. This agency requires that materials with an asbestos content greater than 1% be removed before building demolition or renovation if they are either friable or the work will damage or otherwise render them friable.

We found RACM (acoustical ceiling) at the Site. The removal of RACM requires 10-day advance notification to BAAQMD if more than 100 square feet or 100 linear feet are removed. Even if less than 100 square feet or linear feet are removed, the BAAQMD has rules regarding the methods of removal.

#### **4.1.5 Non-Asbestos Containing Materials**

Refer to Table 2 for materials sampled that do not contain asbestos for the Site.

### **4.2 Detailed Lead Findings and Discussion**

The result of this investigation determined that lead-based paint and lead-containing paint is present at the Site. Intact lead paints do not require paint-stabilization. However, deteriorated (loose and flaking) lead paints must be stabilized prior to demolition or renovation. Where inspected, we observe intact paints at the Site. As shown on Table 3, we representatively sampled paints to comply with Cal/OSHA and DTSC waste disposal regulations during construction.

Paints that contain more than 5,000 ppm lead are considered "lead-based paint" and if deteriorated are considered a "lead-hazard" by the CDPH. Paint chip wastes or material that contains more than 1,000 ppm lead would be classified as California hazardous wastes. Deteriorated paint wastes or materials that contain more than 50 ppm lead, but less than 1,000 ppm lead would need to be re-analyzed by the Soluble Threshold Limit Concentration (STLC) to determine soluble lead content and by the US EPA Total Concentration for Leachable Pollutants (TCLP) test to determine whether the paint or material is either a California or a Federal hazardous waste. If the soluble test(s) exceed 5.0 mg/L, then the waste would be characterized as "hazardous waste" (either California, federal or both). If ceramic tile contains greater than 50 ppm, then it should also be removed and tested for leachable lead per the STLC/TCLP methods, prior to demolition or renovation.

Construction work that disturbs lead-based or lead-containing materials (including demolition) will need to be conducted in accordance with Cal/OSHA's lead in construction regulations (8CCR1532.1). These regulations apply paints and materials that contains any detectable amounts of lead. In theory, this should

not pose a significant problem as this regulation has been in effect since 1992. Lead containing materials may require separate disposal if they contain more than 50 ppm lead. This rule does not apply for intact paint.

Cal/OSHA's lead in construction standard (8CCR1532.1) requires a contractor whose work involves disturbing leaded materials to develop and implement a lead compliance plan. The written lead compliance plan would essentially acknowledge the presence of lead and would describe procedures to minimize airborne lead exposures (e.g., use of dust control, clean up debris daily with a HEPA vacuum, and use good personal hygiene procedures, etc.) consistent with either assumed or known airborne lead exposures. Additionally, if the paint is disturbed (e.g., sanding or chipping), contractor is required to conduct employee exposure assessment to determine appropriate protective measures, including medical surveillance and personal hygiene facilities, and to provide employee training on the hazards of lead related work. Note that lead related work in public buildings that exceeds Cal/OSHA's permissible exposure limit requires that the training be accredited lead worker training under the California Department of Public Health (CDPH).

#### ***4.2.1 Lead-Based Paint***

During our investigation, we found lead-based paints based on bulk samples collected.

- Exterior red paint on metal flashing contains 6,700 ppm lead. This paint is intact and does not require paint-stabilization.
- Exterior green paint on metal guard railing contains 15,000 ppm lead. This paint is intact and does not require paint-stabilization.

#### ***4.2.2 Lead-Containing Paint***

During our investigation, we found deteriorated lead-containing paint based on bulk samples collected.

- Black paint on metal gate contains 380 ppm lead. This paint is intact and does not require paint-stabilization.

#### ***4.2.3 Non-Lead-Containing Paints***

During our investigation, we found non-lead-containing paints (below detection limit) based on bulk samples collected.

- Exterior multi color paint on concrete wall contains lead concentrations less than the detection limit (less than 78 ppm).
- Brown paint on concrete missionary unit contains lead concentrations less than the detection limit (less than 9.5 ppm).

### ***4.3 Detailed PCB Findings and Discussion***

The Resource Conservation and Recovery Act (RCRA) and the Toxic Substance Control Act (TSCA) defines PCB-containing materials as materials containing concentrations of greater than 500 ppm PCB. PCB-contaminated materials are defined as materials containing a concentration of greater than 50 ppm PCB, but less than 500 ppm PCB. Non-PCB materials are defined as containing a concentration of less than 50 ppm PCB.

An assessment was conducted to test for the presence of building materials that may contain PCB. We did not find PCB-containing materials based on bulk samples collected at the Site. Acumen sampled door gasket and floor mastic, which do not contain a detectable concentration of PCBs. PCB bulk sample results

can be found in Table 4. Light ballasts installed before 1980 likely contain PCBs, so these lights should be dismantled and inspected for PCB-free labeling throughout the Site.

#### ***4.4 Universal Hazardous Waste Findings and Discussion***

DTSC has adopted regulations (SB 20 Electronic Waste Recycling Act) for the handling of universal waste or E-Waste. This category is a subset under all hazardous wastes. Universal wastes encompass a variety of electronic devices (including fluorescent lamps, light emitting diode (LED) lights, high-intensity discharge (HID) lamps, light ballasts, smoke detectors and emergency exit signs, mercury thermostats, cathode ray tubes, batteries, etc.) that usually contain mercury, lead, cadmium, chromium, and copper. These materials are considered toxic and are banned from landfill disposal. These materials must be collected and recycled prior to their disturbance during demolition or renovation. Fluorescent light tubes and mercury thermostats should be carefully removed without breaking and packaged for recycling.

Acumen visually assessed the Site and found fluorescent light fixtures that will require inspection and disposal as hazardous waste if they contain PCBs. The abatement contractor will need to assess ballasts and segregate those without the “No PCB” labeling for proper storage and disposal. The fluorescent light tubes are regulated because of their mercury content but these can be recycled instead of disposal as hazardous waste. Although recycling may be more expensive than disposal, it avoids the perpetual liability associated with the generation and disposal of hazardous wastes.

##### ***4.4.1 Summary of Universal Hazardous Wastes***

The following lists the universal hazardous wastes found during this investigation at the Site.

- Ten (10) fluorescent light fixtures with assumed PCB ballasts (Photo 2)
- Two (2) exterior lamps (Photo 5)

## **5.0 Recommendations**

### ***5.1 ACMs/LCMs During Building Demolition or Renovations***

1. Notify potential demolition or renovation contractors of the presence of ACMs at the Site. Disturbance of ACM requires special training and procedures. A Cal/OSHA registered asbestos contractor is required for ACM removals. BAAQMD regulations require that ACM be properly removed and disposed, prior to demolition or renovation where they would be disturbed. This work will require notification to the BAAQMD 10-days prior to removal.
2. Notify potential demolition or renovation contractors of the presence of intact lead-based and lead-containing paints. Disturbance of the lead paints requires compliance with Cal/OSHA’s lead in construction regulation.
3. Sample all assumed materials indicated in this report for asbestos and/or lead to determine if they would need to be removed prior to demolition or renovation.
4. If additional suspect materials were discovered during demolition or renovation, these materials should be sampled to confirm that they do not contain asbestos or lead prior to their removal.
5. The fluorescent lights and exterior lamps at Site will require dismantling and recycling. If not recycled, they would need to be disposed as universal or hazardous waste. The fluorescent light ballasts may contain PCBs, which require inspection to determine proper waste disposal.
6. Prior to submitting bids to perform abatement work, abatement contractors should field verify all the estimated quantity of ACM materials and other hazardous materials stated in this report.

7. Although there is no regulatory requirement for it, it would be advisable to develop either a work plan or specification for the handling of asbestos, lead, and hazardous materials during abatement.

#### **6.0 Managing ACM/LBP in Place (For Portions to Remain)**

1. If the building (of portions there-of) is not abated, the owner will need to notify building occupants and employees of the presence of asbestos, as required under California Health and Safety Code 25915.7-25919.7 (Connelly Bill) and by Cal/OSHA regulations. The materials have a low fiber release potential if it remains undisturbed. Notify contractor and maintenance employees of this report.
2. Prepare and implement an asbestos O&M program to manage ACMs that will remain in place. This asbestos O&M program should detail roles and responsibilities for managing ACM at the complex. The O&M program should establish written policies and procedures for asbestos safe work practices to minimize the potential for unauthorized disturbance of ACM, monitor the condition of ACM and respond to damage or deterioration of ACM, with the goal of preventing the release of airborne asbestos fibers. Implementation of the O&M program will require that facility employees receive annual asbestos training. The O&M program should remain in place as long as ACM remains in the buildings.
3. The California - Proposition 65 rules require posting a sign warning of potential hazards because of the presence of asbestos and lead.

#### **7.0 Conclusions**

Our investigation discovered friable asbestos containing material, which will require abatement prior to demolition or renovation. Intact lead-based and lead-containing paints are present. Universal hazardous wastes will need to be removed and recycled or disposed as hazardous waste.

#### **8.0 Limitations**

Reasonable effort was made by Acumen personnel to locate, and sample suspect hazardous building materials. However, for any facility or building, the existence of unique or concealed ACM or lead-containing materials, other hazardous building materials and debris is a possibility. Acumen does not warrant, guarantee, or profess to have the ability to locate or identify all ACM or other hazardous materials at this facility. The intent of this report is for use in planning, for demolition or renovation purposes. All quantities of materials identified in this report should be field verified by contractors prior to submitting bids to perform abatement work. Additional confirmatory sampling and detailed quantification may be required if the renovation work uncovers additional suspect materials. The report is not intended as a CDPH or HUD defined "lead hazard evaluation" or "lead inspection".

Acumen provided these services consistent with the level and skill ordinarily exercised by members of the profession currently providing similar services under similar circumstances at the time the services were provided. This statement is in lieu of other statements either expressed or implied. This report is intended for the sole use of the named client and their designees. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of certain other users, and use or re-use of this document, the findings, conclusions, or recommendations is at the risk of said user.

As with all such assessments, the results of the sampling represent conditions found on the date of the survey and may not represent conditions found at other times. Additionally, this assessment was limited with respect to the specific parameters indicated above and should not be construed to be a comprehensive evaluation or a definitive representation of all conditions within the facility. The information presented in

this report is intended to be used as a guide to evaluate the need for materials removal, further investigation or the need for modifications to the processes or procedures surveyed.

The client should recognize that all testing and remediation methods have reliability limitations, no method or number of sampling locations can guarantee that a condition will be discovered within the performance of the services as authorized by the client. Additionally, the passage of time may result in a change in the environmental characteristics at this site. This report does not warrant against future operations or conditions that could affect the recommendations made. The results, findings, conclusions, and recommendations expressed in this report are based only on conditions that were observed during Acumen's inspection of the site.

**Table 1**

Asbestos Containing Material  
Willard Clubhouse Recreation Center  
2720 Hillgass Avenue  
Berkeley, CA

June 2, 2023

Location	Material	Results <sup>1</sup>	BAAQMD <sup>2</sup>	EQ <sup>3</sup>	Sample No.
Exterior - By Entry	Spray-on Acoustical Texture Over Concrete Ceiling	Acoustic Texture: 25% CH	RACM	450 SF	COB2335-08A
Exterior - Open Area	Spray-on Acoustical Texture Over Concrete Ceiling	7% CH	RACM	Include Above	COB2335-08B
Exterior - Janitor's Closet	Spray-on Acoustical Texture Over Concrete Ceiling	10% CH	RACM	Include Above	COB2335-08C
Exterior - Break Area	Sink Under Coating	60% CH	Cat I NF	1 Each	COB2335-10A
Restroom Roof	Roofing Materials	Assumed Asbestos (Not Sampled)	Cat I NF	TBD	N/A

**Footnotes**

1. Results report percent (%) asbestos as determined by polarized light microscopy (PLM). Samples that are marked Point Count were analyzed by EPA-600/R93-116 (1993) method as determined by PLM 400 Point Count method and are reported as percentage (%) asbestos. CH = Chrysotile asbestos; AC = Actinolite asbestos; TR = Tremolite asbestos; AM = Amosite asbestos; CR = Crocidolite; Trace = levels of asbestos is less than 1%; ND = no asbestos detected; and Assumed = material to contain asbestos unless proven otherwise.
2. BAAQMD indicates classification into friable as Regulated Asbestos Containing Material (RACM) or Category I (Cat I) or Category II (Cat II) Non-Friable. Depending on methods of removal Category I or II non-friable ACMs could become rendered into friable/RACM. BAAQMD classifications are non-applicable (N/A) for materials with results that are ND for asbestos.
3. EQ means estimated quantity either in square feet (SF), linear feet (LF), or each unit (EA). Estimated quantities are non-applicable (N/A) for materials with results that are ND for asbestos. Estimated quantities should be confirmed by an abatement contractor prior to bid or removal. TBD = To Be Determined.

**Table 2**

Non-Asbestos Containing Materials  
Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2, 2023

<b>Location</b>	<b>Material</b>	<b>Results<sup>1</sup></b>	<b>Sample No.</b>
Roof - South	Roof Field Core Under Concrete Slab	Tar: ND Felt: ND	COB2335-01A
Roof - North	Roof Field Core Under Concrete Slab	Gravel: ND Tar: ND	COB2335-01B
Roof - North	Roof Field Core Under Concrete Slab	Tar: ND Felt: ND Gravel: ND	COB2335-01C
Roof - South	Concrete Slab Over Roof	Concrete: ND	COB2335-02A
Roof - North	Concrete Slab Over Roof	Concrete: ND	COB2335-02B
Roof - South	Mastic Behind Metal Flashing	Mastic: ND	COB2335-03A
Roof - South	Mastic Behind Metal Flashing	Mastic: ND	COB2335-03B
Roof Overhang - Public Restroom	Roof Shingle with Felt Paper	Shingle: ND Felt: ND	COB2335-04A
Roof Overhang - Public Restroom	Roof Shingle with Felt Paper	Shingle: ND Felt: ND	COB2335-04B
Roof Overhang - Public Restroom	Penetration Mastic	Mastic: ND	COB2335-05A
Exterior - Public Restroom	Exterior Concrete Missionary Unit Mortar	Mortar: ND	COB2335-06A
Exterior - Public Restroom	Exterior Concrete Missionary Unit Mortar	Mortar: ND	COB2335-06B
Exterior - Open Area	12x12" Pink with Splotches Vinyl Floor Tile with Mastic	Floor Tile: ND Mastic: ND	COB2335-07A
Exterior - Open Area	12x12" Pink with Splotches Vinyl Floor Tile with Mastic	Floor Tile: ND Mastic: ND	COB2335-07B



**Table 2 (continued)**

Non-Asbestos Containing Materials  
Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2, 2023

<b>Location</b>	<b>Material</b>	<b>Results<sup>1</sup></b>	<b>Sample No.</b>
Exterior - Restroom	Drywall with Taping Mud	Drywall: ND Taping Mud: ND Paint: ND	COB2335-09A
Exterior - Restroom	Drywall with Taping Mud	Drywall: ND Taping Mud: ND Paint: ND	COB2335-09B
Exterior - Restroom	White Paint on Concrete Missionary Unit	ND	COB2335-11A
Exterior - Restroom	White Paint on Concrete Missionary Unit	ND	COB2335-11B
Exterior - Restroom	Yellow Covebase Mastic	ND	COB2335-12A
Exterior - Restroom	Yellow Covebase Mastic	ND	COB2335-12B
Exterior - By Restroom	Green Paint on Wood Wall	ND	COB2335-13A
Exterior - By Entry	Green Paint on Wood Wall	ND	COB2335-13B
Exterior - West Wall	Exterior Multi-Color Paint with Mastic on Concrete Wall	Paint: ND Mastic: ND	COB2335-14A
Exterior - North Wall	Exterior Multi-Color Paint with Mastic on Concrete Wall	Paint: ND Mastic: ND	COB2335-14B
Exterior - At Entry	Door Gasket	ND	COB2335-15A
Exterior - At Entry	Door Gasket	ND	COB2335-15B

**Footnote**

1. Samples were analyzed by polarized light microscopy (PLM) and reported as not containing detectable amounts of asbestos. ND indicates that asbestos was not detected.

**Table 3**

Summary of Lead Paint Sample Results  
Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2, 2023

Location	Material	Result <sup>1</sup>	Condition <sup>2</sup>	EQ <sup>3</sup>	Sample No.
Roof - North	Exterior Red Paint on Metal Flashing	6,700	Intact	N/A	COB2335-PB01
Roof - South	Exterior Green Paint on Metal Guard Railing	15,000	Intact	N/A	COB2335-PB02
Exterior - Public Restroom	Black Paint on Metal Gate	380	Intact	N/A	COB2335-PB04
Exterior - West Wall	Exterior Multi Color Paint on Concrete Wall	< 78	Intact	N/A	COB2335-PB05

**Footnote**

1. Samples are analyzed by Flame Atomic Absorption Spectrometry (AAS). U.S. EPA SW-846 Method 7420 is used for the instrumental analysis. Nitric acid and hydrogen peroxide digestion procedures are based on U.S. EPA SW-846, 3<sup>rd</sup> edition. Results reported in milligram per kilogram (mg/kg) or parts per million (ppm). The "<" sign means below analytical detection limit.
2. Intact paint requires no lead-stabilization; deteriorated paint with greater than 50 ppm lead must be stabilized prior to demolition or renovation.
3. EQ means estimated quantity in square feet (SF). Estimated quantities should be confirmed by an abatement contractor prior to bid or removal. N/A = Lead-stabilization is not required.

**Table 4**

Summary of Lead TTLC Sample Results  
Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2, 2023

<b>Location</b>	<b>Material</b>	<b>Result<sup>1</sup></b>	<b>EQ<sup>2</sup></b>	<b>Sample No.</b>
Roof - Public Restroom	Brown Paint on Concrete Missionary Unit	< 9.5	N/A	COB2335-PB03

**Footnote**

1. Samples are analyzed by Total Threshold Limit Concentration (TTLC) in accordance with EPA Methods 3050B for Acid Digestion (SW 846, 3rd edition, 2007) and 7420 for Analysis (SW-846, 3rd edition, 2007). Results reported in milligram per kilogram (mg/kg) or parts per million (ppm). The "<" sign means below analytical detection limit.
2. EQ means estimated quantity either in square feet (SF). Ceramic tile contains more than 1,000 ppm lead would be classified as California hazardous wastes. If ceramic tile or other material contains greater than 50 ppm lead but less than 1,000 ppm lead, then it should also be removed and tested for leachable lead per the STLC/TCLP methods, prior to demolition or renovation. Estimated quantities should be confirmed by an abatement contractor prior to bid or removal. N/A = Removal is not required.

**Table 5**

Summary of PCB Sample Results  
Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2, 2023

<b>Location</b>	<b>Material</b>	<b>Results<sup>1</sup></b>	<b>Sample No.</b>
Exterior – Entry Door	Door Gasket	ND	COB2335-PCB01A
Exterior – Entry Door	Door Gasket	ND	COB2335-PCB01B
First Floor – Open Area	Mastic Under 12x12” Pink Vinyl Floor Tile	ND	COB2335-PCB02A
First Floor – Open Area	Mastic Under 12x12” Pink Vinyl Floor Tile	ND	COB2335-PCB02B

**Footnote**

1. Samples were analyzed by Gas Chromatography. U.S. EPA Method 8082A is used to determine the concentrations of polychlorinated biphenyls (PCBs) as Aroclors or as individual PCB congeners in extracts from solid, tissue, and aqueous matrices, using open-tubular, capillary columns with electron capture detectors (ECD) or electrolytic conductivity detectors (ELCD). ND indicates that PCB was not detected.



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## **Appendix A**

Laboratory Reports

Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2023

**MICRO ANALYTICAL LABORATORIES, INC.**  
**BULK ASBESTOS ANALYSIS - POLARIZED LIGHT MICROSCOPY (PLM)**



1092  
 Paul Spillane  
 Acumen Industrial Hygiene, Inc.  
 1032 Irving Street, #922  
 San Francisco, CA 94122-2216

PROJECT:  
**PROJECT NO. COB 2335**  
**WILLARD CLUBHOUSE REC. CENTER**  
**2720 HILLEGASS AVENUE**  
**BERKELEY, CA**

Micro Log In **302659**  
 Total Samples 30  
 Date Sampled 06/02/2023  
 Date Received 06/07/2023  
 Date Analyzed 06/08/2023

SAMPLE IDENTIFICATION	ASBESTOS QUANTITY (AREA %) / TYPES / LAYERS	DOMINANT OTHER MATERIALS
	If absent, ND Is Reported (No Asbestos Detected)	

Client #: <b>COB2335-01A</b> Micro #: 302659-01 Analyst: CR ROOF - SOUTH ROOF FIELD CORE UNDER CONCRETE SLAB	TAR: ND FELT: ND	12 % CELLULOSE 2 % FIBROUS GLASS NFM: TARI/ASPHALT, BINDER
Client #: <b>COB2335-01B</b> Micro #: 302659-02 Analyst: CR ROOF - NORTH ROOF FIELD CORE UNDER CONCRETE SLAB	GRAVEL: ND TAR: ND	8 % CELLULOSE 10 % FIBROUS GLASS NFM: TARI/ASPHALT, BINDER
Client #: <b>COB2335-01C</b> Micro #: 302659-03 Analyst: CR MO ROOF - NORTH ROOF FIELD CORE UNDER CONCRETE SLAB	TAR: ND FELT: ND GRAVEL: ND	8 % CELLULOSE 3 % FIBROUS GLASS NFM: TARI/ASPHALT, BINDER
Client #: <b>COB2335-02A</b> Micro #: 302659-04 Analyst: CR ROOF - SOUTH CONCRETE SLAB OVER ROOF	CONCRETE: ND	7 % CELLULOSE NFM: ROCK FRAGMENTS, CARBONATE, BINDER
Client #: <b>COB2335-02B</b> Micro #: 302659-05 Analyst: CR ROOF - NORTH CONCRETE SLAB OVER ROOF	CONCRETE: ND	NFM: ROCK FRAGMENTS, CARBONATE, BINDER

Technical Supervisor:

*Muh Oshimes*  
 For Baojia Ke, Ph.D.

6/10/2023

Date Reported

NVLAP Lab Code 101872-0 (TESTING). Analyses use Polarized Light Microscopy (PLM), Micro Analytical SOP PLM-101. Basic techniques follow EPA - Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (originally published 1982), and EPA-600/R93-116 (1993). The 1993 method covers all types of bulk materials and is based on the 1982 Method, with improved analytical techniques for layered samples as required for NESHAP compliance. Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Tremolite-asbestos or actinolite-asbestos may be indistinguishable by PLM from some similar, non-regulated amphiboles (e.g. the "Libby Amphiboles" richterite and winchite), and should be confirmed by TEM. The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM weight percent analysis are recommended. Only dominant non-asbestos materials (fibrous and non-fibrous) are listed. This analysis shall not be construed as conclusive for the presence of any reported materials other than asbestos, or for the absence of any non-asbestos material. Common interferences include, but are not limited to: cellulose, fibrous glass, other man-made vitreous fibers, synthetic fibers, elongate fragments of calcium sulfate, talc, wollastonite, animal hair, and other miscellaneous elongate particles. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. If more than one distinct sample is received in the same container, samples shall be marked with letters and analyzed separately. Layers within a sample are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. The notation ND (or "NONE DETECTED") indicates a result of "NO ASBESTOS DETECTED" in a homogeneous sample, or in a layer of a heterogeneous sample. Composite asbestos percentages from multiple layers are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Reanalyzed samples are denoted by two sets of analyst initials. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced except in full, without the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed as received. NFM = Non-fibrous materials.



**MICRO ANALYTICAL LABORATORIES, INC.**  
**BULK ASBESTOS ANALYSIS - POLARIZED LIGHT MICROSCOPY (PLM)**



1092  
 Paul Spillane  
 Acumen Industrial Hygiene, Inc.  
 1032 Irving Street, #922  
 San Francisco, CA 94122-2216

PROJECT:  
**PROJECT NO. COB 2335**  
**WILLARD CLUBHOUSE REC. CENTER**  
**2720 HILLEGASS AVENUE**  
**BERKELEY, CA**

Micro Log In **302659**  
 Total Samples 30  
 Date Sampled 06/02/2023  
 Date Received 06/07/2023  
 Date Analyzed 06/08/2023

SAMPLE IDENTIFICATION		ASBESTOS QUANTITY (AREA %) / TYPES / LAYERS	DOMINANT OTHER MATERIALS
If absent, ND Is Reported (No Asbestos Detected)			
Client #:	COB2335-03A	MASTIC: ND	5 % CELLULOSE  NFM: BINDER, OTHER, MISCELLANEOUS.
Micro #: 302659-06	Analyst: CR ROOF - SOUTH MASTIC BEHIND METAL FLASHING		
Client #:	COB2335-03B	MASTIC: ND	8 % CELLULOSE  NFM: BINDER, OTHER, MISCELLANEOUS.
Micro #: 302659-07	Analyst: CR ROOF - SOUTH MASTIC BEHIND METAL FLASHING		
Client #:	COB2335-04A	SHINGLE: ND FELT: ND	5 % CELLULOSE 12 % FIBROUS GLASS  NFM: ROCK FRAGMENTS, CARBONATE, BINDER
Micro #: 302659-08	Analyst: CR ROOF OVERHANG - PUBLIC RESTROOM ROOF SHINGLE WITH FELT PAPER		
Client #:	COB2335-04B	SHINGLE: ND FELT: ND	5 % CELLULOSE 12 % FIBROUS GLASS  NFM: ROCK FRAGMENTS, CARBONATE, BINDER
Micro #: 302659-09	Analyst: CR ROOF OVERHANG - PUBLIC RESTROOM ROOF SHINGLE WITH FELT PAPER		
Client #:	COB2335-05A	MASTIC: ND	5 % CELLULOSE  NFM: BINDER, OTHER, MISCELLANEOUS.
Micro #: 302659-10	Analyst: CR ROOF OVERHANG - PUBLIC RESTROOM PENETRATION MASTIC		

Technical Supervisor:

*Mark Olivares*  
 For Baojia Ke, Ph.D.

6/10/2023

Date Reported

NVLAP Lab Code 101872-0 (TESTING). Analyses use Polarized Light Microscopy (PLM), Micro Analytical SOP PLM-101. Basic techniques follow EPA - Appendix E to Subpart E of 40 CFR Part 763: Interim Method for the Determination of Asbestos in Bulk Insulation Samples' (originally published 1982), and EPA-600/R93-116 (1993). The 1993 method covers all types of bulk materials and is based on the 1982 Method, with improved analytical techniques for layered samples as required for NESHAP compliance. Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Tremolite-asbestos or actinolite-asbestos may be indistinguishable by PLM from some similar, non-regulated amphiboles (e.g. the "Libby Amphiboles" richterite and winchite), and should be confirmed by TEM. The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM weight percent analysis are recommended. Only dominant non-asbestos materials (fibrous and non-fibrous) are listed. This analysis shall not be construed as conclusive for the presence of any reported materials other than asbestos, or for the absence of any non-asbestos material. Common interferences include, but are not limited to: cellulose, fibrous glass, other man-made vitreous fibers, synthetic fibers, elongate fragments of calcium sulfate, talc, wollastonite, animal hair, and other miscellaneous elongate particles. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. If more than one distinct sample is received in the same container, samples shall be marked with letters and analyzed separately. Layers within a sample are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. The notation ND (or "NONE DETECTED") indicates a result of "NO ASBESTOS DETECTED" in a homogeneous sample, or in a layer of a heterogeneous sample. Composite asbestos percentages from multiple layers are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Reanalyzed samples are denoted by two sets of analyst initials. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced except in full, without the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed as received. NFM = Non-fibrous materials.



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**BULK ASBESTOS ANALYSIS - POLARIZED LIGHT MICROSCOPY (PLM)**



1092  
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 Acumen Industrial Hygiene, Inc.  
 1032 Irving Street, #922  
 San Francisco, CA 94122-2216

PROJECT:  
**PROJECT NO. COB 2335**  
**WILLARD CLUBHOUSE REC. CENTER**  
**2720 HILLEGASS AVENUE**  
**BERKELEY, CA**

Micro Log In **302659**  
 Total Samples 30  
 Date Sampled 06/02/2023  
 Date Received 06/07/2023  
 Date Analyzed 06/08/2023

SAMPLE IDENTIFICATION		ASBESTOS QUANTITY (AREA %) / TYPES / LAYERS	DOMINANT OTHER MATERIALS
		If absent, ND is Reported (No Asbestos Detected)	
Client #:	COB2335-06A	MORTAR: ND	3 % CELLULOSE  NFM: ROCK FRAGMENTS, CARBONATE, BINDER
Micro #: 302659-11	Analyst: CR EXT - PUBLIC RESTROOM EXTERIOR CMU MORTAR		
Client #:	COB2335-06B	MORTAR: ND	3 % CELLULOSE  NFM: ROCK FRAGMENTS, CARBONATE, BINDER
Micro #: 302659-12	Analyst: CR EXT - PUBLIC RESTROOM EXTERIOR CMU MORTAR		
Client #:	COB2335-07A	FLOOR TILE: ND MASTIC: ND	3 % CELLULOSE  NFM: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Micro #: 302659-13	Analyst: CR MO EXT - OPEN AREA 12"X12" PINK WITH SPLOTCHES VFT WITH MASTIC		
Client #:	COB2335-07B	FLOOR TILE: ND MASTIC: ND	3 % CELLULOSE  NFM: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Micro #: 302659-14	Analyst: CR EXT - OPEN AREA 12"X12" PINK WITH SPLOTCHES VFT WITH MASTIC		
Client #:	COB2335-08A	ACOUSTIC TEXTURE: 25% CHRYSOTILE ASBESTOS	5 % CELLULOSE  NFM: BINDER, OTHER, MISCELLANEOUS.
Micro #: 302659-15	Analyst: CR EXT - BY ENTRY SPRAY ON ACOUSTICAL TEXTURE OVER CONCRETE CEILING		

Technical Supervisor:

*Mark Collins*  
 Mark Collins  
 Ph.D. Baojia Ke, Ph.D.

6/10/2023

Date Reported

NVLAP Lab Code 101872-0 (TESTING). Analyses use Polarized Light Microscopy (PLM), Micro Analytical SOP PLM-101. Basic techniques follow EPA - Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (originally published 1982), and EPA-800/R93-116 (1993). The 1993 method covers all types of bulk materials and is based on the 1982 Method, with improved analytical techniques for layered samples as required for NESHAP compliance. Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Tremolite-asbestos or actinolite-asbestos may be indistinguishable by PLM from some similar, non-regulated amphiboles (e.g. the "Libby Amphiboles" richterite and winchite), and should be confirmed by TEM. The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM weight percent analysis are recommended. Only dominant non-asbestos materials (fibrous and non-fibrous) are listed. This analysis shall not be construed as conclusive for the presence of any reported materials other than asbestos, or for the absence of any non-asbestos material. Common interferences include, but are not limited to: cellulose, fibrous glass, other man-made vitreous fibers, synthetic fibers, elongate fragments of calcium sulfate, talc, wollastonite, animal hair, and other miscellaneous elongate particles. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. If more than one distinct sample is received in the same container, samples shall be marked with letters and analyzed separately. Layers within a sample are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. The notation ND (or "NONE DETECTED") indicates a result of "NO ASBESTOS DETECTED" in a homogeneous sample, or in a layer of a heterogeneous sample. Composite asbestos percentages from multiple layers are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Reanalyzed samples are denoted by two sets of analyst initials. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced except in full, without the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed as received. NFM = Non-fibrous materials.



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PROJECT:  
**PROJECT NO. COB 2335**  
**WILLARD CLUBHOUSE REC. CENTER**  
**2720 HILLEGASS AVENUE**  
**BERKELEY, CA**

Micro Log In **302659**  
 Total Samples 30  
 Date Sampled 06/02/2023  
 Date Received 06/07/2023  
 Date Analyzed 06/09/2023

SAMPLE IDENTIFICATION	ASBESTOS QUANTITY (AREA %) / TYPES / LAYERS If absent, ND Is Reported (No Asbestos Detected)	DOMINANT OTHER MATERIALS
Client #: <b>COB2335-08B</b> Micro #: 302659-16 Analyst: KG EXT - OPEN AREA SPRAY ON ACOUSTICAL TEXTURE OVER CONCRETE CEILING	<b>7% CHRYSOTILE ASBESTOS</b>	NFM: MICA, BINDER.
Client #: <b>COB2335-08C</b> Micro #: 302659-17 Analyst: KG EXT - JANITOR'S CLOSET SPRAY ON ACOUSTICAL TEXTURE OVER CONCRETE CEILING	<b>10% CHRYSOTILE ASBESTOS</b>	NFM: MICA, BINDER.
Client #: <b>COB2335-09A</b> Micro #: 302659-18 Analyst: KG EXT - RESTROOM DRYWALL WITH TAPING MUD	<b>DRYWALL: ND TAPING MUD: ND PAINT: ND</b>	<b>10 % CELLULOSE 2 % FIBROUS GLASS</b>  NFM: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: <b>COB2335-09B</b> Micro #: 302659-19 Analyst: KG EXT - RESTROOM DRYWALL WITH TAPING MUD	<b>DRYWALL: ND TAPING MUD: ND PAINT: ND</b>	<b>10 % CELLULOSE 2 % FIBROUS GLASS</b>  NFM: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: <b>COB2335-10A</b> Micro #: 302659-20 Analyst: KG EXT - BREAK AREA SINK UNDER COATING	<b>60% CHRYSOTILE ASBESTOS</b>	NFM: MISCELLANEOUS PARTICLES

Technical Supervisor:

*Mark Olivares* 6/10/2023  
 For Baojia Ke, Ph.D. Date Reported

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 1032 Irving Street, #922  
 San Francisco, CA 94122-2216

PROJECT:  
**PROJECT NO. COB 2335**  
**WILLARD CLUBHOUSE REC. CENTER**  
**2720 HILLEGASS AVENUE**  
**BERKELEY, CA**

Micro Log In **302659**  
 Total Samples 30  
 Date Sampled 06/02/2023  
 Date Received 06/07/2023  
 Date Analyzed 06/09/2023

SAMPLE IDENTIFICATION	ASBESTOS QUANTITY (AREA %) / TYPES / LAYERS <small>If absent, ND is Reported (No Asbestos Detected)</small>	DOMINANT OTHER MATERIALS
Client #: <b>COB2335-11A</b> Micro #: 302659-21 Analyst: KG EXT - RESTROOM WHITE PAINT ON CMU	ND	NFM: OPAQUES MISCELLANEOUS PARTICLES
Client #: <b>COB2335-11B</b> Micro #: 302659-22 Analyst: KG EXT - RESTROOM WHITE PAINT ON CMU	ND	NFM: OPAQUES MISCELLANEOUS PARTICLES
Client #: <b>COB2335-12A</b> Micro #: 302659-23 Analyst: KG MO EXT - RESTROOM YELLOW COVEBASE MASTIC	ND	NFM: CARBONATE, BINDER.
Client #: <b>COB2335-12B</b> Micro #: 302659-24 Analyst: KG EXT - RESTROOM YELLOW COVEBASE MASTIC	ND	NFM: CARBONATE, BINDER.
Client #: <b>COB2335-13A</b> Micro #: 302659-25 Analyst: KG EXT - BY RESTROOM GREEN PAINT ON WOOD WALL	ND	NFM: OPAQUES MISCELLANEOUS PARTICLES

Technical Supervisor: *Maria Olivares* 6/10/2023  
 For Baojia Ke, Ph.D. Date Reported

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**WILLARD CLUBHOUSE REC. CENTER**  
**2720 HILLEGASS AVENUE**  
**BERKELEY, CA**

Micro Log In **302659**  
 Total Samples 30  
 Date Sampled 06/02/2023  
 Date Received 06/07/2023  
 Date Analyzed 06/09/2023

## SAMPLE IDENTIFICATION

## ASBESTOS QUANTITY (AREA %) / TYPES / LAYERS

DOMINANT  
OTHER MATERIALS

If absent, ND is Reported (No Asbestos Detected)

Client #:	COB2335-13B		
Micro #:	302659-26	Analyst: KG	ND
	EXT - BY ENTRY GREEN PAINT ON WOOD WALL		NFM: OPAQUES MISCELLANEOUS PARTICLES
Client #:	COB2335-14A		
Micro #:	302659-27	Analyst: KG	PAINT: ND MASTIC: ND
	EXT - WEST WALL EXTERIOR MULTI-COLOR PAINT WITH MASTIC ON CONCRETE WALL		NFM: OPAQUES MISCELLANEOUS PARTICLES
Client #:	COB2335-14B		
Micro #:	302659-28	Analyst: KG	PAINT: ND MASTIC: ND
	EXT - NORTH WALL EXTERIOR MULTI-COLOR PAINT WITH MASTIC ON CONCRETE WALL		NFM: OPAQUES MISCELLANEOUS PARTICLES
Client #:	COB2335-15A		
Micro #:	302659-29	Analyst: KG	ND
	EXT - AT ENTRY DOOR GASKET		NFM: CARBONATE, BINDER.
Client #:	COB2335-15B		
Micro #:	302659-30	Analyst: KG	ND
	EXT - AT ENTRY DOOR GASKET		NFM: CARBONATE, BINDER.

Technical Supervisor:

*Mark Oliveira*  
 For Baojia Ke, Ph.D.

6/10/2023

Date Reported

NVLAP Lab Code 101872-0 (TESTING). Analyses use Polarized Light Microscopy (PLM), Micro Analytical SOP PLM-101. Basic techniques follow EPA - Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (originally published 1982), and EPA-800/R93-116 (1993). The 1993 method covers all types of bulk materials and is based on the 1982 Method, with improved analytical techniques for layered samples as required for NESHAP compliance. Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Tremolite-asbestos or actinolite-asbestos may be indistinguishable by PLM from some similar, non-regulated amphiboles (e.g. the "Libby Amphiboles" richterite and winchite), and should be confirmed by TEM. The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM weight percent analysis are recommended. Only dominant non-asbestos materials (fibrous and non-fibrous) are listed. This analysis shall not be construed as conclusive for the presence of any reported materials other than asbestos, or for the absence of any non-asbestos material. Common interferences include, but are not limited to: cellulose, fibrous glass, other man-made vitreous fibers, synthetic fibers, elongate fragments of calcium sulfate, talc, wollastonite, animal hair, and other miscellaneous elongate particles. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. If more than one distinct sample is received in the same container, samples shall be marked with letters and analyzed separately. Layers within a sample are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. The notation ND (or "NONE DETECTED") indicates a result of "NO ASBESTOS DETECTED" in a homogeneous sample, or in a layer of a heterogeneous sample. Composite asbestos percentages from multiple layers are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Reanalyzed samples are denoted by two sets of analyst initials. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced except in full, without the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed as received. NFM = Non-fibrous materials.



ACUMEN

BULK CHAIN OF CUSTODY FORM

INDUSTRIAL HYGIENE INC

1032 IRVING STREET #922 SAN FRANCISCO CA 94122-2216

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1 of 3

302659

Project No. COB 2335

Location: Willard Clubhouse Rec. Center Laboratory: Micro Analytical Laboratories, Inc.

Address: 2720 Hillegass Ave, Berkeley, CA Turnaround: [X] Normal [ ] 24 Hour [ ] Rush

Sampling Date: 6/2/2023 Collection By: Tam Pham

Sample No.	Floor	Location	Description	Method
1 COB2335-01A	Roof	South	Roof field core under concrete slab	PLM Attest
2 01B		North		
3 01C		North		
4 02A		South	concrete slab over roof	
5 02A		North		
6 03A		South	Mortar behind metal flashing	
7 03B		South		
8 04A	Roof overhang	Public Restroom	Roof shingle w/ felt paper	
9 04B				
10 05A			penetration mortar	

Other Instructions: Email results to lab@acumen-ih.com.

Please sign this form below acknowledging sample receipt and return executed form with laboratory reports.

Sent By:	Received By:
Date Submitted: 6/7/2023	Date Received: 6/7/23 13:55

Sample(s) Submitted Via: [X] Hand Delivered [ ] Federal Express (Air Bill # \_\_\_\_\_) [ ] Other: \_\_\_\_\_



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1032 IRVING STREET #922 SAN FRANCISCO CA 94122-2216

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BULK CHAIN OF CUSTODY FORM

20f3  
302659

Project No. COB 2335

Location: (STATE)  
Address:

Laboratory: Micro Analytical Laboratories, Inc.

Turnaround:  Normal  24 Hour  Rush

Sampling Date: 6/2/2023

Collection By: Tam Pham

Sample No.	Floor	Location	Description	Method
11 COB2335-06A	EXT	Public Rest Room	Exterior CMU mortar	PCM <del>MSDS</del>
12 06B				
13 07A		open Area	12x12" pink w/ spots w/ MASTIC	
14 07B				
15 08A		By entry	Spray on acoustical texture over concrete ceiling	
16 08B		open Area		
17 08C		Janitor's closet		
18 09A		Restroom	Drywall w/ taping mud	
19 09B				
20 10A		Break Area	sink under coating	

Other Instructions: Email results to [lab@acumen-ih.com](mailto:lab@acumen-ih.com).

Please sign this form below acknowledging sample receipt and return executed form with laboratory reports.

Sent By:	Received By:
Date Submitted: 6/7/2023	Date Received: 6/8/23 13:55

Sample(s) Submitted Via:  Hand Delivered  Federal Express (Air Bill # \_\_\_\_\_)  Other: \_\_\_\_\_



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BULK CHAIN OF CUSTODY FORM

INDUSTRIAL HYGIENE INC

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3 of 3  
302659

Project No.

COB2335

Location:

CSAME

Laboratory:

Micro Analytical Laboratories, Inc.

Address:

Turnaround:

Normal  24 Hour  Rush

Sampling Date:

6/2/2023

Collection By:

Tam Pham

Sample No.	Floor	Location	Description	Method
21 COB2335-11A	1	Restroom	white paint on CMU	PCM Asbestos
22 11B	1			
23 12A	1		yellow cobalt base mastic	
24 12B	1			
25 13A	1	By Restroom	green paint on wood wall	
26 13B	1	By entry		
27 14A	Ext	West wall	Exterior multi-color paint w/ mastic on concrete wall	
28 14B		North wall		
29 15A		At entry	Door gasket	
30 15B				

Other Instructions: Email results to [lab@acumen-ih.com](mailto:lab@acumen-ih.com).

Please sign this form below acknowledging sample receipt and return executed form with laboratory reports.

Sent By:	Received By:
Date Submitted: 6/7/2023	Date Received: 6/7/23 13:55

Sample(s) Submitted Via:  Hand Delivered  Federal Express (Air Bill # \_\_\_\_\_)  Other: \_\_\_\_\_



**MICRO ANALYTICAL LABORATORIES, INC.****LEAD IN PAINT - FLAME AAS (SW846)**

1092

Paul Spillane  
Acumen Industrial Hygiene, Inc.  
1032 Irving Street, #922  
San Francisco, CA 94122-2216

PROJECT:  
PROJECT NO. COB 2335  
WILLARD CLUBHOUSE REC. CENTER  
2720 HILLEGASS AVENUE  
BERKELEY, CA

Micro Log In 302660  
Total Samples 4  
Date Sampled 06/02/2023  
Date Received 06/07/2023  
Date Analyzed 06/07/2023

Sample ID	Weight Percent	mg/kg (ppm)	RDL
Client: COB2335-PB01 Lab: 302660-01 ROOF - NORTH RED PAINT ON METAL FLASHING	0.67 %	6700	0.0810 % 810 mg/kg
Client: COB2335-PB02 Lab: 302660-02 ROOF - SOUTH GREEN PAINT ON METAL GUARD RAILING	1.5 %	15000	0.0810 % 810 mg/kg
Client: COB2335-PB04 Lab: 302660-03 EXT - PUBLIC RESTROOM BLACK PAINT ON METAL GATE	0.038 %	380	0.0081 % 81 mg/kg
Client: COB2335-PB05 Lab: 302660-04 EXT - WEST WALL EXTERIOR MULTI COLOR PAINT ON CONCRETE WALL	< 0.0078 %	< 78	0.0078 % 78 mg/kg

Technical Supervisor: \_\_\_\_\_

Long T. Nguyen, Chemistry Supervisor

6/7/2023

Date Reported

Analyst: \_\_\_\_\_

RN

AIHA-LAP, LLC Accredited Laboratory, ID #101768. Samples are analyzed by Flame Atomic Absorption Spectrometry (AAS) using SOP 23-Paint. This SOP is based on U.S. EPA SW-846 Method 7420 for Instrumental analysis, and on ASTM E-1645-21 for nitric acid and hydrogen peroxide digestion. Unless otherwise indicated on this report, all required Quality Control samples have been determined to be in control prior to releasing these analytical results. Unless otherwise stated in this report, all samples were received in acceptable condition for analysis. Note: due to software limitations, the number of reported significant figures does not necessarily reflect the uncertainty of the analysis. If the amount of sample available for analysis is lower than advisable for this method, detection limits and uncertainty will be higher. This report must not be reproduced except in full, without the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed as received. Unit explanations: mg = milligrams; kg = kilograms; ppm = parts per million. N/A = Not Applicable. RDL = Report Detection Limit.



**ACUMEN**  
**INDUSTRIAL HYGIENE INC**  
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 WWW.ACUMEN-IH.COM

**BULK CHAIN OF CUSTODY FORM** (AA painting)  
 302660

Project No. **COB 2335**

Location: **LSAME**  
 Address:  
 Sampling Date: **6/2/2023**

Laboratory: Micro Analytical Laboratories, Inc.  
 Turnaround:  Normal  24 Hour  Rush  
 Collection By: Tam Pham

Sample No.	Floor	Location	Description	Method
1   COB 2335- Pb01	Roof	North	Red paint on metal flashing	FLAA LEAD
2   Pb02	Roof	South	Green paint on metal guard railing	
Pb03	1	Public Restroom	Brown paint on CMU	TTLC LEAD
3   Pb04	EXT		Black paint on metal gate	FLAA LEAD
4   Pb05	1	WBA Wall	exterior multi-color paint on concrete wall	

Other Instructions: Email results to [lab@acumen-ih.com](mailto:lab@acumen-ih.com).

Please sign this form below acknowledging sample receipt and return executed form with laboratory reports.

Sent By:	Received By: <b>ES</b>
Date Submitted: <b>6/7/2023</b>	Date Received: <b>6/7/23 13:55</b>

Sample(s) Submitted Via:  Hand Delivered  Federal Express (Air Bill # \_\_\_\_\_)  Other: \_\_\_\_\_



**MICRO ANALYTICAL LABORATORIES, INC.****EPA SW-846 LEAD-TTLC**

1092  
Paul Spillane  
Acumen Industrial Hygiene, Inc.  
1032 Irving Street, #922  
San Francisco, CA 94122-2216

PROJECT:

PROJECT NO. COB 2335  
WILLARD CLUBHOUSE REC. CENTER  
2720 HILLEGASS AVENUE  
BERKELEY, CA

Micro Log In **302661**  
Total Samples 1  
Date Sampled 06/02/2023  
Date Received 06/07/2023  
Date Analyzed 06/07/2023

Sample ID	Lead Concentration, ppm	RDL, ppm	Comments
Client <b>COB2335-PB03</b> Micro 302661-01 ROOF - PUBLIC RESTROOM BROWN PAINT ON CMU	< 9.5	9.5	

Technical Supervisor: \_\_\_\_\_

Long T. Nguyen, Chemistry Supervisor

6/7/2023

Date Reported

Analyst: \_\_\_\_\_

RN

AIHA-LAP LLC ELLAP Accredited Laboratory, ID #101768. Samples are analyzed by Flame Atomic Absorption Spectrometry (FLAA) using SOP 23-Soll (in accordance with EPA Methods 3050B for Acid Digestion (SW 846, 3rd edition, 2007) and 7420 for Analysis (SW-846, 3rd edition, 2007)). NOTE: Water samples are analyzed by FLAA in accordance with Method 3111B (Standard Methods for the Examination of Water and Wastewater, 18th edition). Unless otherwise indicated on this report, all required Quality Control samples have been determined to be in control prior to releasing these analytical results. Unless otherwise stated in this report, all samples were received in acceptable condition for analysis. Note: due to software limitations, the number of reported significant figures does not necessarily reflect the uncertainty of the analysis. This report must not be reproduced except in full without the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed as received. Unit explanations: mg = milligrams; kg = kilograms; ppm = parts per million. TTLC = TOTAL THRESHOLD LIMIT CONCENTRATION. L = liters. RDL = Report Detection Limit. Note: mg / Kg is the same as ppm for solids, and mg/L is the same as ppm for water.

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INDUSTRIAL HYGIENE INC

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BULK CHAIN OF CUSTODY FORM

(TTLC)

302661

Project No. COB 2335

Location: LSALE

Laboratory: Micro Analytical Laboratories, Inc.

Address:

Turnaround:  Normal  24 Hour  Rush

Sampling Date: 6/2/2023

Collection By: Tam Pham

Sample No.	Floor	Location	Description	Method
COB 2335- Pb01	Roof	North	Red paint on metal flashing	FLAA LEAD
Pb02	Roof	South	Green paint on metal guard railing	/
Pb03	1	Public Restroom	Brown paint on CMU	TTLC LEAD
Pb04	EXT	/	Black paint on metal gate	FLAA LEAD
Pb05	1	West Wall	exterior multi-color paint on concrete wall	/

1

Other Instructions: Email results to lab@acumen-ih.com.

Please sign this form below acknowledging sample receipt and return executed form with laboratory reports.

Sent By:	Received By:
Date Submitted: 6/7/2023	Date Received: 6/7/23 13:55

Sample(s) Submitted Via:  Hand Delivered  Federal Express (Air Bill # \_\_\_\_\_)  Other: \_\_\_\_\_



# McC Campbell Analytical, Inc.

"When Quality Counts"

## Analytical Report

**WorkOrder:** 2306588

**Report Created for:** Acumen Industrial Hygiene, Inc.

1032 Irving Street, #922  
San Francisco, CA 94122

**Project Contact:** Results

**Project P.O.:**

**Project:** COB2335; Willard Clubhouse Rec. Center

**Project Received:** 06/08/2023

Analytical Report reviewed & approved for release on 06/16/2023 by:

Jennifer Lagerbom

Project Manager

*The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in a case narrative.*



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CA ELAP 1644 ♦ NELAP 4033 ORELAP





## Glossary of Terms & Qualifier Definitions

**Client:** Acumen Industrial Hygiene, Inc.  
**Project:** COB2335; Willard Clubhouse Rec. Center

**WorkOrder:** 2306588

### Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
CPT	Consumer Product Testing not NELAP Accredited
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
LQL	Lowest Quantitation Level
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit <sup>1</sup>
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PDSD	Post Digestion Spike Duplicate
PF	Prep Factor
RD	Relative Difference
RL	Reporting limit <sup>2</sup>
RPD	Relative Percent Difference
RRT	Relative Retention Time
RSD	Relative Standard Deviation
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure

<sup>1</sup> MDL is the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, 40CFR, Part 136, Appendix B, EPA 821-R-16-006, December 2016.

<sup>2</sup> RL is the lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. (The RL cannot be lower than the lowest calibration standard used in the initial calibration of the instrument and must be greater than the MDL.)



## Glossary of Terms & Qualifier Definitions

**Client:** Acumen Industrial Hygiene, Inc.

**WorkOrder:** 2306588

**Project:** COB2335; Willard Clubhouse Rec. Center

TEQ Toxicity Equivalents

TZA TimeZone Net Adjustment for sample collected outside of MAI's UTC.

WET (STLC) Waste Extraction Test (Soluble Threshold Limit Concentration)

### **Analytical Qualifiers**

S Surrogate recovery outside accepted recovery limits.

a3 Sample diluted due to high organic content interfering with quantitative/or qualitative analysis.

a4 Reporting limits raised due to the sample's matrix prohibiting a full volume extraction.

c4 Surrogate recovery outside of the control limits due to coelution with another peak(s) / cluttered chromatogram.

h4 Sulfuric acid permanganate (EPA 3665) cleanup





## Analytical Report

**Client:** Acumen Industrial Hygiene, Inc.  
**Date Received:** 06/08/2023 15:20  
**Date Prepared:** 06/08/2023  
**Project:** COB2335; Willard Clubhouse Rec. Center

**WorkOrder:** 2306588  
**Extraction Method:** SW3550B  
**Analytical Method:** SW8082  
**Unit:** mg/kg

### Polychlorinated Biphenyls (PCBs) Aroclors

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
COB2335-PCB02A	2306588-003A	Bulk Material	06/02/2023	GC20 06092313.D	271302

Analytes	Result	RL	DF	Date Analyzed
Aroclor1016	ND	10	20	06/09/2023 17:26
Aroclor1221	ND	10	20	06/09/2023 17:26
Aroclor1232	ND	10	20	06/09/2023 17:26
Aroclor1242	ND	10	20	06/09/2023 17:26
Aroclor1248	ND	10	20	06/09/2023 17:26
Aroclor1254	ND	10	20	06/09/2023 17:26
Aroclor1260	ND	10	20	06/09/2023 17:26
PCBs, total	ND	10	20	06/09/2023 17:26

Surrogates	REC (%)	Limits	Date Analyzed
Decachlorobiphenyl	105	70-130	06/09/2023 17:26

Analyst(s): CK

Analytical Comments: h4,a4

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
COB2335-PCB02B	2306588-004A	Bulk Material	06/02/2023	GC20 06092314.D	271302

Analytes	Result	RL	DF	Date Analyzed
Aroclor1016	ND	10	20	06/09/2023 17:42
Aroclor1221	ND	10	20	06/09/2023 17:42
Aroclor1232	ND	10	20	06/09/2023 17:42
Aroclor1242	ND	10	20	06/09/2023 17:42
Aroclor1248	ND	10	20	06/09/2023 17:42
Aroclor1254	ND	10	20	06/09/2023 17:42
Aroclor1260	ND	10	20	06/09/2023 17:42
PCBs, total	ND	10	20	06/09/2023 17:42

Surrogates	REC (%)	Limits	Date Analyzed
Decachlorobiphenyl	107	70-130	06/09/2023 17:42

Analyst(s): CK

Analytical Comments: h4,a4





## Analytical Report

**Client:** Acumen Industrial Hygiene, Inc.  
**Date Received:** 06/08/2023 15:20  
**Date Prepared:** 06/08/2023  
**Project:** COB2335; Willard Clubhouse Rec. Center

**WorkOrder:** 2306588  
**Extraction Method:** SW3550B/3630C  
**Analytical Method:** SW8082  
**Unit:** mg/kg

### Polychlorinated Biphenyls (PCBs) Aroclors w/ Column Style Clean-up

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
COB2335-PCB01A	2306588-001A	Caulk	06/02/2023	GC40 06142370.d	271301

Analytes	Result	RL	DF	Date Analyzed
Aroclor1016	ND	10	20	06/15/2023 04:18
Aroclor1221	ND	10	20	06/15/2023 04:18
Aroclor1232	ND	10	20	06/15/2023 04:18
Aroclor1242	ND	10	20	06/15/2023 04:18
Aroclor1248	ND	10	20	06/15/2023 04:18
Aroclor1254	ND	10	20	06/15/2023 04:18
Aroclor1260	ND	10	20	06/15/2023 04:18
PCBs, total	ND	10	20	06/15/2023 04:18

Surrogates	REC (%)	Qualifiers	Limits	Date Analyzed
Decachlorobiphenyl	164	S	70-130	06/15/2023 04:18

Analyst(s): CN Analytical Comments: a3,c4

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
COB2335-PCB01B	2306588-002A	Caulk	06/02/2023	GC40 06142371.d	271301

Analytes	Result	RL	DF	Date Analyzed
Aroclor1016	ND	10	20	06/15/2023 04:32
Aroclor1221	ND	10	20	06/15/2023 04:32
Aroclor1232	ND	10	20	06/15/2023 04:32
Aroclor1242	ND	10	20	06/15/2023 04:32
Aroclor1248	ND	10	20	06/15/2023 04:32
Aroclor1254	ND	10	20	06/15/2023 04:32
Aroclor1260	ND	10	20	06/15/2023 04:32
PCBs, total	ND	10	20	06/15/2023 04:32

Surrogates	REC (%)	Qualifiers	Limits	Date Analyzed
Decachlorobiphenyl	143	S	70-130	06/15/2023 04:32

Analyst(s): CN Analytical Comments: a3,c4





## Quality Control Report

<b>Client:</b> Acumen Industrial Hygiene, Inc.	<b>WorkOrder:</b> 2306588
<b>Date Prepared:</b> 06/08/2023	<b>BatchID:</b> 271302
<b>Date Analyzed:</b> 06/09/2023	<b>Extraction Method:</b> SW3550B
<b>Instrument:</b> GC20	<b>Analytical Method:</b> SW8082
<b>Matrix:</b> Bulk Material	<b>Unit:</b> mg/kg
<b>Project:</b> COB2335; Willard Clubhouse Rec. Center	<b>Sample ID:</b> MB/LCS/LCSD-271302

### QC Summary Report for SW8082

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Aroclor1016	ND	0.050	0.050	-	-	-
Aroclor1221	ND	0.050	0.050	-	-	-
Aroclor1232	ND	0.050	0.050	-	-	-
Aroclor1242	ND	0.050	0.050	-	-	-
Aroclor1248	ND	0.050	0.050	-	-	-
Aroclor1254	ND	0.050	0.050	-	-	-
Aroclor1260	ND	0.050	0.050	-	-	-

#### Surrogate Recovery

Decachlorobiphenyl	0.036			0.05	72	70-130
--------------------	-------	--	--	------	----	--------

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Aroclor1016	0.17	0.16	0.15	111	109	70-130	1.58	20
Aroclor1260	0.14	0.14	0.15	94	95	70-130	1.04	20

#### Surrogate Recovery

Decachlorobiphenyl	0.035	0.036	0.050	71	72	70-130	1.71	20
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## Quality Control Report

<b>Client:</b>	Acumen Industrial Hygiene, Inc.	<b>WorkOrder:</b>	2306588
<b>Date Prepared:</b>	06/08/2023	<b>BatchID:</b>	271301
<b>Date Analyzed:</b>	06/15/2023 - 06/16/2023	<b>Extraction Method:</b>	SW3550B/3630C
<b>Instrument:</b>	GC23	<b>Analytical Method:</b>	SW8082
<b>Matrix:</b>	Bulk Material	<b>Unit:</b>	mg/kg
<b>Project:</b>	COB2335; Willard Clubhouse Rec. Center	<b>Sample ID:</b>	MB/LCS/LCSD-271301

### QC Summary Report for SW8082 w/ Column Clean-up

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Aroclor1016	ND	0.050	0.050	-	-	-
Aroclor1221	ND	0.050	0.050	-	-	-
Aroclor1232	ND	0.050	0.050	-	-	-
Aroclor1242	ND	0.050	0.050	-	-	-
Aroclor1248	ND	0.050	0.050	-	-	-
Aroclor1254	ND	0.050	0.050	-	-	-
Aroclor1260	ND	0.050	0.050	-	-	-

**Surrogate Recovery**

Decachlorobiphenyl	0.040			0.05	81	70-130
--------------------	-------	--	--	------	----	--------

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Aroclor1016	0.17	0.17	0.15	115	115	70-130	0.459	20
Aroclor1260	0.16	0.16	0.15	110	110	70-130	0.298	20

**Surrogate Recovery**

Decachlorobiphenyl	0.046	0.044	0.050	91	88	70-130	3.09	20
--------------------	-------	-------	-------	----	----	--------	------	----





**McC Campbell Analytical, Inc.**  
 "When Quality Counts"

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 Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269  
 http://www.mccampbell.com / E-mail: main@mccampbell.com

### WORK ORDER SUMMARY

**Client Name:** ACUMEN INDUSTRIAL HYGIENE, INC.  
**Client Contact:** Results  
**Contact's Email:** lab@acumen-ih.com

**Project:** COB2335; Willard Clubhouse Rec. Center

**Work Order:** 2306588  
**QC Level:** LEVEL 2  
**Date Logged:** 6/8/2023

**Comments:**

WaterTrax  CLIP  EDF  Excel  Email  EQUIS  HardCopy  ThirdParty  J-flag

LabID	ClientSampID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	U** Head Space Weight	Dry-Collection Date & Time	TAT	Test Due Date	Sediment Content	Hold	Sub Out
001A	COB2335-PCB01A	Caulk	SW8082 (PCBs w/ Column Style Clean-up)	1	Plastic Baggie, Extra Small	<input type="checkbox"/>	6/2/2023	5 days	6/16/2023	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
002A	COB2335-PCB01B	Caulk	SW8082 (PCBs w/ Column Style Clean-up)	1	Plastic Baggie, Extra Small	<input type="checkbox"/>	6/2/2023	5 days	6/16/2023	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
003A	COB2335-PCB02A	Bulk Material	SW8082 (PCBs)	1	Plastic Baggie, Extra Small	<input type="checkbox"/>	6/2/2023	5 days	6/15/2023	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
004A	COB2335-PCB02B	Bulk Material	SW8082 (PCBs)	1	Plastic Baggie, Extra Small	<input type="checkbox"/>	6/2/2023	5 days	6/15/2023	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**NOTES:** \* STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).  
 - Organic extracts are held for 40 days before disposal; Inorganic extract are held for 30 days.  
 - MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.  
 U\*\* = An unpreserved container was received for a method that suggests a preservation in order to extend hold time for analysis.





2306588

ACUMEN

BULK CHAIN OF CUSTODY FORM

INDUSTRIAL HYGIENE INC

1032 IRVING STREET #922 SAN FRANCISCO CA 94122-2216

TEL 415 242 6060 FAX 415 242 6005

WWW.ACUMEN-IH.COM

Project No. COB2335

Location: Willard Clubhouse Rec. Center

Laboratory: McCampbell Analytical, Inc.

Address: 2720 Hillgass Ave. Berkeley, CA

Turnaround:  Normal  24 Hour  Rush

Sampling Date: 6/2/2023

Collection By: Tam Pham

Sample No.	Floor	Location	Description	Method
COB2335-PCB01A	EXT	Entry door	Door gasket	PCB EPA 8082
PCB01B	EXT			
PCB02A	1	open Area	Mastic under 12x12" pink VFT	
PCB02B	1			

Other Instructions: Email results to [lab@acumen-ih.com](mailto:lab@acumen-ih.com).

Please sign this form below acknowledging sample receipt and return executed form with laboratory reports.

Sent By: <i>[Signature]</i>	Received By: <i>[Signature]</i>
Date Submitted: 6/7/2023	Date Received: 6/8/23 1120

Sample(s) Submitted Via:  Hand Delivered  Federal Express (Air Bill # \_\_\_\_\_)  Other: Courier

By: *[Signature]* 6/8/23 1520 *[Signature]* 6/18/23 1520 *[Signature]*



### Sample Receipt Checklist

Client Name: Acumen Industrial Hygiene, Inc.  
Project: COB2335; Willard Clubhouse Rec. Center  
WorkOrder No: 2306588 Matrix: Bulk Material/Caulk  
Carrier: Benjamin Yslas (MAI Courier)

Date and Time Received: 6/8/2023 15:20  
Date Logged: 6/8/2023  
Received by: Lilly Ortiz  
Logged by: Lilly Ortiz

Chain of Custody (COC) Information

- Chain of custody present? Yes  No
- Chain of custody signed when relinquished and received? Yes  No
- Chain of custody agrees with sample labels? Yes  No
- Sample IDs noted by Client on COC? Yes  No
- Date and Time of collection noted by Client on COC? Yes  No
- Sampler's name noted on COC? Yes  No
- COC agrees with Quote? Yes  No  NA

Sample Receipt Information

- Custody seals intact on shipping container/cooler? Yes  No  NA
- Custody seals intact on sample bottles? Yes  No  NA
- Shipping container/cooler in good condition? Yes  No
- Samples in proper containers/bottles? Yes  No
- Sample containers intact? Yes  No
- Sufficient sample volume for indicated test? Yes  No

Sample Preservation and Hold Time (HT) Information

- All samples received within holding time? Yes  No  NA
- Samples Received on Ice? Yes  No

(Ice Type: WET ICE )

- Sample/Temp Blank temperature Temp: 2.5°C NA
- ZHS conditional analyses: VOA meets zero headspace requirement (VOCs, TPHg/BTEX, RSK)? Yes  No  NA
- Sample labels checked for correct preservation? Yes  No
- pH acceptable upon receipt (Metal: <2; Nitrate 353.2/4500NO3: <2; 522: <4; 218.7: >8)? Yes  No  NA

UCMR Samples:

- pH tested and acceptable upon receipt (200.7: ≤2; 533: 6 - 8; 537.1: 6 - 8)? Yes  No  NA
- Free Chlorine tested and acceptable upon receipt (<0.1mg/L) [not applicable to 200.7]? Yes  No  NA

-----

Comments:



**ACUMEN**

INDUSTRIAL HYGIENE INC

1032 IRVING STREET #922 SAN FRANCISCO CA 94122

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**Appendix B**

Sample Location Floor Plans

Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA

June 2023



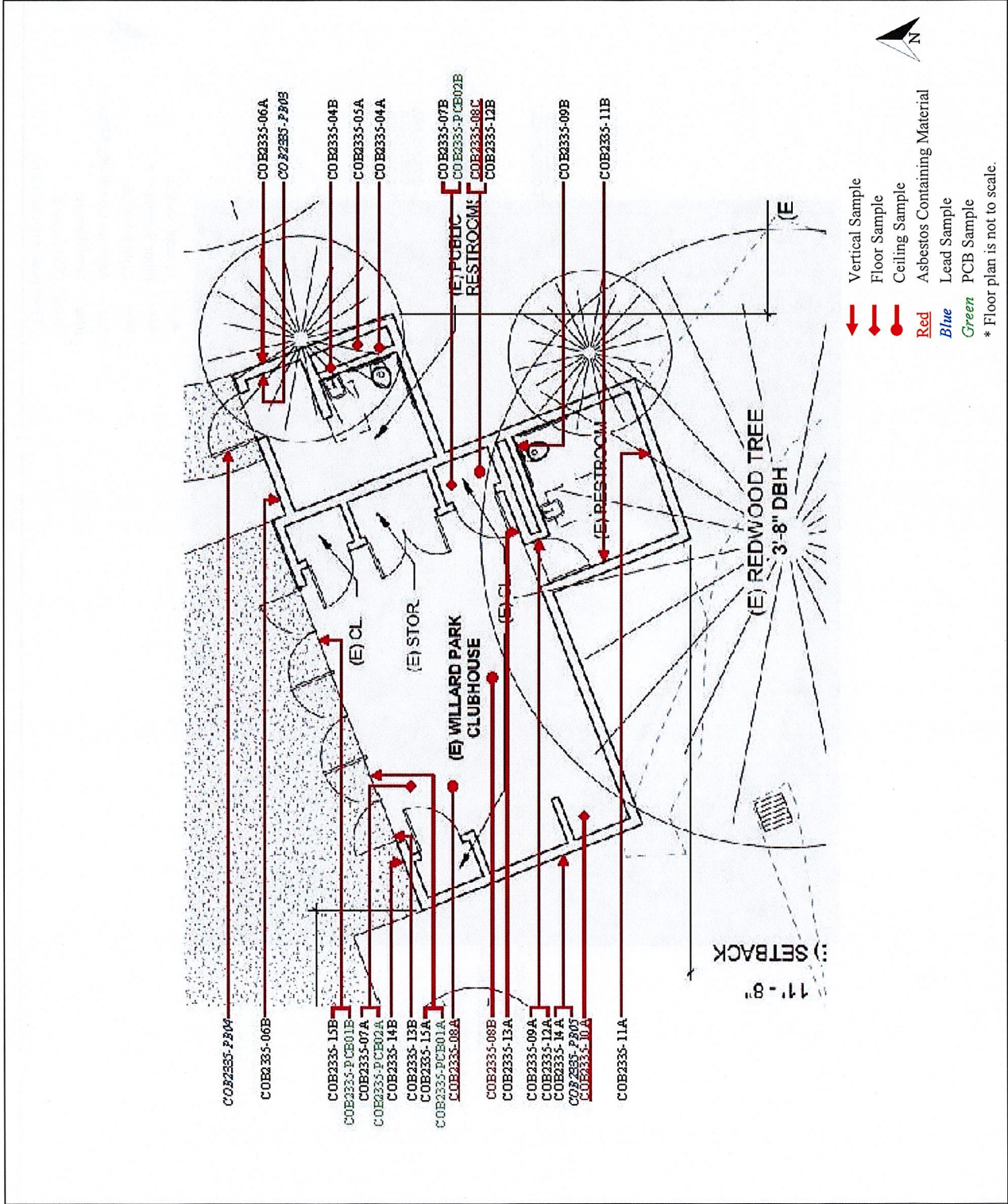


**ACUMEN**

INDUSTRIAL HYGIENE INC  
1032 IRVING STREET #922  
SAN FRANCISCO CA 94122  
415 242 6060  
WWW.ACUMENHI.COM

Project  
Willard Clubhouse Rec. Center  
2720 Hillgass Avenue  
Berkeley, CA

Project No.	Date
COB2335	06/02/2023
Location	
-	
Level	
First Floor	





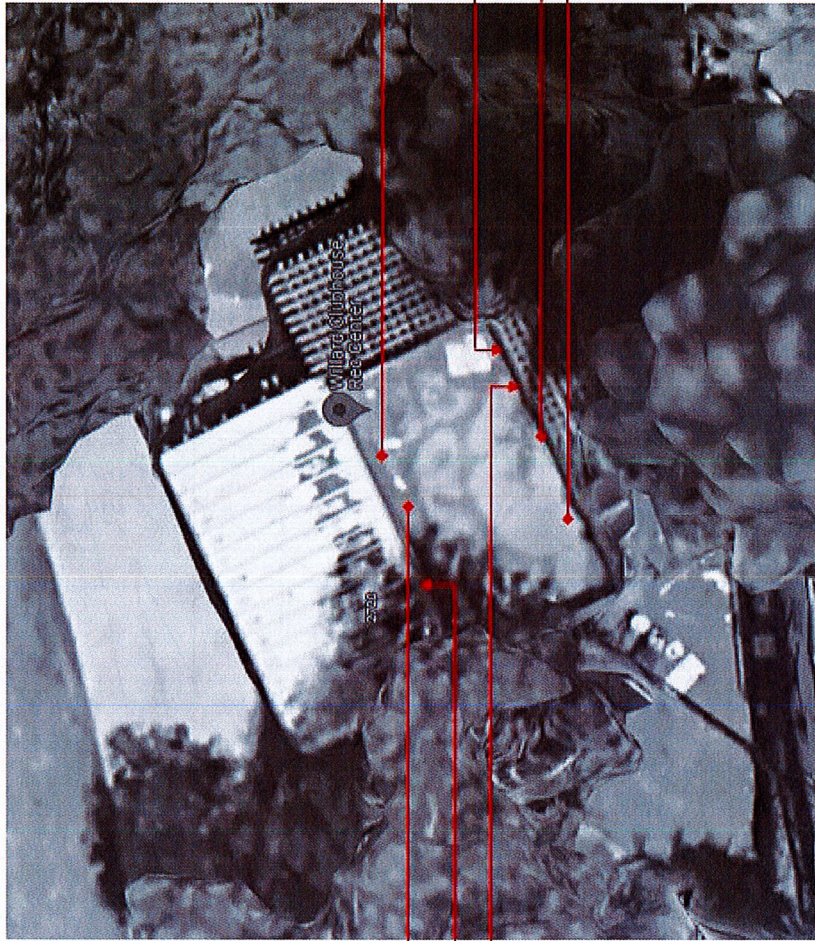


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INDUSTRIAL HYGIENE INC  
1032 IRVING STREET #922  
SAN FRANCISCO CA 94122  
415 242 6060  
WWW.ACUMENI.H.COM

**Project**  
Willard Clubhouse Rec. Center  
2720 Hillegass Avenue  
Berkeley, CA

<b>Project No.</b>	<b>Date</b>
COB2335	06/02/2023
<b>Location</b>	
-	
<b>Level</b>	
Roof	



- Vertical Sample
  - Floor Sample
  - Ceiling Sample
  - Asbestos Containing Material
  - Lead Sample
  - PCB Sample
- \* Floor plan is not to scale.





**ACUMEN**

**INDUSTRIAL HYGIENE INC**

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## **Appendix C**

### **Photographs**

**Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, CA**

**June 2023**



**Photo 1**  
Willard Clubhouse Recreation Center.



**Photo 2**  
Spray-on acoustical texture over concrete ceiling contains up to 25% chrysotile asbestos and fluorescent light fixtures with assumed PCB ballast.





**Photo 3**

Sink under coating contains 60% asbestos.



**Photo 4**

Suspect roof above the clubhouse's restroom is assumed to contain asbestos until proven otherwise.





**Photo 5**  
Exterior lamp.

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX J  
ASBESTOS ABATEMENT  
SPECIFICATIONS**



**ACUMEN**

INDUSTRIAL HYGIENE INC

1032 IRVING STREET #922 SAN FRANCISCO California 94122

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### **Asbestos Abatement Specifications**

Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, California

August 2023

Acumen Project No. COB 2335A

*Prepared For:*

City of Berkeley  
Parks, Recreation & Waterfront Department  
1947 Center Street, 5th Floor  
Berkeley, CA 94704

Paul M. Spillane, CHH, CAC (August 22, 2023)



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Willard Clubhouse Recreation Center  
2720 Hillegass Avenue  
Berkeley, California

August 2023

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## **PART ONE: GENERAL**

### **1.1 Description**

- A. Furnish all labor, materials, facilities, equipment, services, employee training and testing, permits and agreements necessary to remove and dispose of asbestos containing materials in accordance with these specifications, the latest regulations from the U.S. Environmental Protection Agency (EPA), the Bay Area Air Quality Management District (BAAQMD), the U.S. Occupational Safety and Health Administration (OSHA), the State of California Department of Health Services (DOHS), the California Department of Industrial Relations - Division of Occupational Safety and Health (Cal/OSHA), and any other applicable federal, state, and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provision shall apply.
- B. The work specified herein shall be performed by persons trained, knowledgeable and qualified in the state-of-the art techniques of asbestos abatement, handling and the subsequent cleaning of contaminated areas as directed by a CONTRACTOR supervisor with competent person qualifications dedicated for the duration of the project.

### **1.2 Scope of Work**

- A. This asbestos abatement is limited to areas of the building scheduled for demolition.

#### *ABATEMENT SCOPE OF WORK*

The work covered by this section shall include the removal and disposal of both non-regulated asbestos-containing materials (ACM) and regulated asbestos-containing materials (RACM), where found during the site renovation project. Known ACM/RACM materials, locations and estimated quantities are described in the attached asbestos survey report:

- *Pre-Demolition Survey Report, Asbestos, Lead, and Other Hazardous Building Materials Investigation Willard Clubhouse Recreation Center, 2720 Hillegass Avenue Berkeley, California, June 2023, Acumen Industrial Hygiene, Inc.*

The CONTRACTOR shall be responsible for verifying dimensions and quantities as necessary for determining project costs as required for site rehabilitation project. Per the previous survey report, asbestos has been identified in the following locations:

- Friable materials: The friable ACM found within this Scope of Work include the following materials:
  - Spray-on acoustical texture over concrete ceiling contains up to 25% chrysotile asbestos (samples COB2335-08A, COB2335-08B and COB2335-08C). There are approximately 450 square feet of this RACM present throughout the building. The removal of this material is considered Cal/OSHA Class I asbestos abatement.
- Non-friable materials: The non-friable ACM found within this Scope of Work include the following materials:
  - Sink under coating contains 60% asbestos (sample COB2335-10A). We found one (1) sink in the building. The removal of this Category I non-friable material is considered Cal/OSHA Class II asbestos abatement.



- B. Materials currently outside the scope of work, but are assumed present:
- Suspect roofing materials over clubhouse restroom's roof are assumed (not sampled) to contain asbestos unless bulk samples are taken to prove otherwise. These materials are considered Category I non-friable and require Cal/OSHA Class II abatement procedure if they were found to contain asbestos. Quantity is to be determined. These materials should be sampled prior to demolition.
  - Demolition, which may expose additional pipe/duct insulation, may also require abatement procedures.
  - Lead-Based and Lead Containing paint was found during our investigation
  - Exterior red paint on metal flashing contains 6,700 ppm lead. This paint is intact and does not require paint-stabilization.
  - Exterior green paint on metal guard railing contains 15,000 ppm lead. This paint is intact and does not require paint-stabilization.
  - Black paint on metal gate contains 380 ppm lead. This paint is intact and does not require paint-stabilization.
- C. The removal operations shall include, but not be limited to, the following:
- Provision to assure that no member of the public is able to gain access to the asbestos work areas at any time. The CONTRACTOR shall maintain adequate access and egress routes from the building at all times.
  - Provision of worker training, respiratory protection, and medical examinations to meet applicable regulations.
  - Provision of temporary lighting and power to work areas including installation of ground fault interrupters.
  - Preparation of work area(s) including: erection of temporary isolation barriers; and establishment of negative pressure within the work area(s).
  - Construction of enclosure system(s) for worker and equipment decontamination as required by either regulation or these specifications, whichever is most stringent.
  - Maintenance of negative pressure in all Class I work area(s) throughout active removal in these areas of the project.
  - Removal and proper disposal of specified regulated ACM.
  - Decontamination of work area(s) for final visual inspection.
- D. The CONTRACTOR shall provide a designated qualified project supervisor to be on site full time daily during all asbestos removal activity. The project supervisor shall be qualified as a competent person as defined in 8 CCR 1529.

### **1.3 Licensing and Certification**

- A. The CONTRACTOR shall hold a current, valid asbestos license issued by the California State Contractors' Licensing Board (SCLB) and a current valid Certificate of Registration for Asbestos-Related Work, issued by the California Department of Industrial Relations - Division of Occupational Safety and Health (Cal/OSHA).
- B. Copies of the SCLB license and the Cal/OSHA Certificate shall be displayed proximate to but outside the work areas during the duration of the project.

## 1.4 Notices and Documentation

- A. The estimated amount of RACM is greater than 100 square feet. The CONTRACTOR shall notify BAAQMD for more than 100 linear or square feet of friable RACM.
- B. The CONTRACTOR shall notify in writing the Cal/OSHA District Office at least one (1) day before commencement of the project in the event the removal is more than 100 square feet of asbestos containing construction material.
- C. Copies of notifications shall be provided to OWNER REPRESENTATIVE.

## 1.5 Definitions

In addition to the definitions set forth in 8 CCR 1529, the following definitions apply throughout the Contract Documents:

1. **Air Exhaust (Negative Pressure) System** - a portable, powered HEPA-filtered system used to exhaust air from the work area to outside the building. A differential pressure must be maintained at any point in the work area no less than -0.020 inches water gauge relative to the pressure at any point outside the work area at all times, unless otherwise noted or approved.
2. **Amended Water** - water to which a surfactant has been added at a ratio according to the manufacturer's directions.
3. **Asbestos Containing Material** - a material determined to contain 1% or more asbestos as determined by polarized light microscopy (PLM).
4. **Asbestos Work Area** - a work space within which all exposed surfaces, except those being removed, and fixed equipment have been sealed with intact layer(s) of polyethylene sheeting or equivalent. Work can be performed in this area that may result in the release of asbestos fibers into the work space only.
5. **Authorized Visitor** - a representative of the OWNER, or a representative of any regulatory or other agency having jurisdiction over the project.
6. **Breaching** - a rift or gap in the critical or secondary barriers that allow egress of air from the containment to outside, or vice versa.
7. **CFM** - cubic feet per minute.
8. **Cleaning** - the process of eliminating asbestos and/or suspect asbestos particulate contamination from surfaces and objects. A surface is accepted to be clean if its accumulation of dust, residue, or debris can not be further removed by either of the following methods:
  - Wet method - cleaning using a combination of cloths, mops, nylon bristle brushes, scouring pads, or other tools which have been dampened with amended water, and by afterwards disposing of these tools as asbestos-contaminated waste.
  - Dry method - cleaning using a HEPA-filtered vacuum cleaner with the proper attachments.
9. **Competent Person** - a person capable of identifying and eliminating asbestos hazards as defined per Cal/OSHA Regulation 8 CCR 1529.
10. **Confined Space** - a space large enough for entry by a human; with limited means for entry and egress; and not designed for continuous occupancy, as defined by general industry safety orders regulation 8 CCR 5157.
11. **Contaminated Area** - a work area where airborne concentrations of ACM exceed or can reasonably be expected to exceed the PEL, if disturbed.

12. **Critical Barrier** - a unit of temporary construction which provides the only separation between an asbestos work area and an adjacent space.
13. **Daily Cleanup** - daily cleanup of all ACM removed. Freestanding accumulations of ACM removed during the day shall not be left from one shift to the next.
14. **Daily Visual Inspection** - inspections conducted at the end of each shift by competent person to verify that gross debris removed during the shift has been cleaned up. No further gross removal may occur until daily visual inspection has been passed.
15. **Decontamination Enclosure System** - a series of connected rooms with curtained doorways between any two adjacent rooms, for the decontamination of workers or of materials and equipment. A decontamination enclosure system contains at least one airlock.
16. **Encapsulant (Sealant)** - a liquid material which can be applied to asbestos-containing material and which controls the possible release of asbestos fibers from the material by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).
17. **Encapsulation** - all herein specified procedures necessary to coat asbestos-containing material or asbestos contaminated surfaces with an encapsulant to control the possible release of asbestos fibers into the ambient air.
18. **Equipment Decontamination Enclosure System** - a decontamination system for materials and equipment consisting of a designated area of the work area for a washroom, holding room and clean equipment room.
19. **Excursion Limit** - a level of airborne fibers specified by OSHA as an occupational exposure limit for asbestos set at 1.0 total fibers per cubic centimeter as measured over a 30-minute period.
20. **Fibers/cc** - fibers per cubic centimeter.
21. **Friable** - a material that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure and includes previously non-friable materials that become damaged to the extent that, when dry, it may be crumbled, pulverized, or reduced to powder by hand pressure.
22. **Ground Fault Interrupter (GFI)** - a device which automatically de-energizes any high voltage system component which has developed a fault in the ground line.
23. **HEPA Filter** - a high efficiency particulate air (HEPA) filter which has a tested and documented efficiency for trapping and retaining a minimum of 99.97% of a 0.3 micrometer (aerodynamic diameter) dioctylphthalate (DOP) test aerosol when tested in accordance with Military Standard No. 282 and Army Instruction Manual 136-300-175A, and as defined by EPA and ASHRAE.
24. **HEPA Vacuum Equipment** - vacuuming equipment with a (UL 586 label) HEPA filtration system capable of collecting and retaining asbestos fibers.
25. **Make-up Air** - supplied or re-circulated air to offset that which has been exhausted from an area.
26. **Medical Surveillance** - a periodic comprehensive review of a worker's health status as required by 8 CCR 1529.
27. **MSDS** - Material Safety Data Sheet.
28. **OWNER Representative** – Acumen Industrial Hygiene, Inc., San Francisco, California (asbestos/lead consultant). This would also include other outside consultants and/or OWNER's designated project manager.
29. **Regulated Work Area** – Any demarcated area within which asbestos containing materials are to be removed, including any adjoining area where asbestos wastes or debris may accumulate.

30. **Surfactant** - an agent added to water to decrease surface tension and thus increase water's ability to wet or penetrate bulk materials.
31. **Final Visual Inspection** - a visual inspection by the OWNER REPRESENTATIVE of the work area under adequate lighting to ensure that the work area is free of visible suspect three-dimensional asbestos material, debris, and dust.
32. **Washroom** - a room between the work area and holding area in the equipment decontamination enclosure system. The washroom comprises an airlock.
33. **Wet Cleaning** - the process of eliminating asbestos contamination from building surfaces and objects using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.
34. **Wetting Agents** - materials that are added to water which are used for wetting the asbestos-containing material in order for the water to penetrate more effectively.
35. **Work Area** - designated rooms, spaces, zones, or areas of the project in which asbestos abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions. A contained work area is a work area which has been sealed, plasticized, and equipped with a decontamination enclosure system. A non-contained work area is an isolated or controlled-access work area which has not been plasticized nor equipped with a decontamination enclosure system.
36. **Worker Decontamination Enclosure System** - a decontamination system for workers consisting of a clean room in which to vacuum off protective clothing, and adequate washing facilities and supplies equipment room.

## 1.6 Regulations and Standards

- A. The CONTRACTOR shall comply with applicable federal, state, municipal, and local regulations including, but not limited to, the latest editions of the following standards:

### Federal Occupational Safety and Health Administration (OSHA):

- 29 CFR Part 1910.12 - Construction Work.
- 29 CFR Part 1910.1001 - General Industry.
- 29 CFR Part 1926.1101 - Construction Industry.
- 29 CFR Part 1910.134 - Use of Respirators.
- 29 CFR Part 1910.20 - General Safety and Health Provisions-Access to Employee Exposure and Medical Records.
- 29 CFR Part 1910.1200 - Hazard Communication.
- 29 CFR Part 1910.145 - Specifications for Accident Prevention Signs and Tag Titles.

### U.S. Department of Transportation (DoT):

- 49 CFR Parts 171 and 172 - Hazardous Substances.

### U.S. Environmental Protection Agency (EPA):

- National Emission Standards for Hazardous Air Pollutants (NESHAPS) - 40 CFR 61 Part M.
- Asbestos Hazards Emergency Response Act (AHERA) - 40 CFR Part 763, as adopted.

### State of California

- Assembly Bill (AB) 2040 - Yearly Registration of CONTRACTORS.
  - California Proposition 65.
  - California Department of Industrial Relations, Division of Occupational Safety and Health (DOSH), Title 8, California Administrative Code:
    - Asbestos Standard 8CCR1529 and 8CCR 5208.
    - Lead-Related Construction Standard 8CCR 1532.1.
    - Confined Space Entry - General Industry Safety Orders (Chapter 4, Subchapter 7, Article 108, Sections 8CCR 5157 and 8CCR 5158).
    - Carcinogen Regulation 8CCR 5209.
    - Carcinogen and Asbestos Registration Sections 340-344.53, 341.6 amended and 341.9 amended through 341.14.
    - Respiratory Protection Equipment Standard 8CCR 5144.
    - Hazard Communications Standard 8CCR 5194.
    - Permissible Exposure Standard 8CCR5155.
    - Accident Prevention Program 8CCR 3203.
    - Access to Employee Exposure and Medical Records 8CCR 3204.
    - Accident Prevention Signs 8CCR 6003.
    - Emergency Action Plan 8CCR 3220.
    - Fire Prevention Plan 8CCR 3221.
    - Electrical Safety Orders, Chapter 4, Subchapter 5.
    - Construction Safety Orders, Chapter 4, Subchapter 4.
  - California State License Board (CSLB), California Business and Professions Code Section 7058.5.
  - Bay Area Air Quality Management District (BAAQMD) Regulations, including Regulation 11, Rule 2, dated November 5, 1990.
  - California EPA - Title 22 and 23, California Administrative Code Disposal Requirements.
  - California State Board of Equalization Excise Tax Unit.
- B. Post all employment notices per applicable regulations in a conspicuous place at the jobsite. Assure that the notices are not altered, defaced, or covered by other materials.

### **1.7 Submittals and Notices**

- A. The project shall require submission of the following, prior to the initial set-up or mobilization:
- Satisfactory proof that written notification has been provided to the Cal/OSHA district office at least 24 hours before asbestos removal work begins.
  - Satisfactory proof that written notification has been provided to BAAQMD for removal is more than 100 linear or square feet of friable ACM (including mastic removal using solvents and buffers per BAAQMD June 2003 Compliance Advisory) 10-days before abatement begins. Proof that all required permits and applicable variances have been obtained.

- Documentation indicating that all employees have received asbestos worker training at an AHERA accredited facility, and applicable refresher courses.
  - Documentation indicating that all employees engaged in asbestos removal have received appropriate medical examinations and have successfully passed fit test(s) for the respirator(s) to be worn. As a minimum, medical exams must be consistent with requirements in Cal/OSHA Regulation 8 CCR 1529.
  - A copy of the SCLB License and Cal/OSHA Registration Certificate.
  - Material Safety Data Sheets (OSHA form 174 or equivalent) for all chemicals used during work performed under this specification in compliance with Cal/OSHA's Hazard Communications Standard 8 CCR 5192. MSDS shall be provided, including but not limited to the following chemicals and substances, as applicable: coatings that can be stripped, polyethylene sheeting, spray adhesive, mastic removers, surfactants, and encapsulants.
  - Waste hauler's identification number and vehicle certification documentation.
  - A list of company representatives and their phone numbers where contacts can be made for emergency purposes after regular working hours and during weekends.
  - Emergency action plan for dealing with
    - an asbestos fiber release from the work area;
    - a medical emergency;
    - an earthquake emergency;
    - a fire inside or outside the work area.
- B. A schedule of the project from mobilization through completion of the work.
- C. A work plan including schedule of completion.
- D. The name and qualifications of the laboratory proposed for personnel sample analyses. Laboratory to be current in NVLAP program.
- E. The CONTRACTOR shall provide written notification to OWNER's REPRESENTATIVE of his intent to start work at least 10 days in advance. CONTRACTOR shall not start work until written authorization to proceed is received from OWNER.

### **1.8 Owner Representative**

- A. AN OWNER REPRESENTATIVE has been retained to advise OWNER in matters pertaining to the work performed in accordance with these specifications and requirements.
- B. The OWNER REPRESENTATIVE will act as OWNER's liaison in technical matters involving the asbestos-related work.
- C. The OWNER REPRESENTATIVE shall review submittals for general conformance with the abatement concept and compliance with this Specification.
- D. OWNER REPRESENTATIVE is authorized by OWNER to have free access to all asbestos work areas, to assist in interpretation of procedures, and to advise on all provisions of the contract documents pertaining to the control of asbestos.
- E. OWNER REPRESENTATIVE will advise OWNER to stop work if in the course of performing their monitoring duties, they observe an instance of substantial nonconformance with the contract documents and/or a situation presenting a health hazard to workers, OWNER employees, or the

public. Work shall not resume until corrective measures have been enforced. Instances of substantial non-conformance shall include but not be limited to the following:

- Loss of negative pressurization;
  - Elevated fiber count outside containment;
  - Activities or misconduct imperiling worker's or public safety.
- F. All asbestos abatement shall be conducted using good work practices to prevent the release of asbestos fibers outside the work area. If poor work practices are observed, the OWNER REPRESENTATIVE shall direct the CONTRACTOR to make the necessary corrections. If appropriate corrections are not made after repeated warnings, or if an immediate threat exists that fibers could be released outside the work area, abatement work shall be stopped. The decision to stop work shall be made jointly by the OWNER REPRESENTATIVE and OWNER.
- G. The OWNER REPRESENTATIVE may perform air sampling inside (personal and area) and outside the asbestos work area during the project. The CONTRACTOR shall cooperate fully with the Consultant and ensure the cooperation of his workers during collection of air samples and work area inspections.
- H. The OWNER REPRESENTATIVE may conduct periodic inspections of abatement work areas to verify gross cleanup of ACM removed at the completion of the shift. No further abatement shall be permitted until all ACM has been satisfactorily cleaned up, and until surfaces abated that shift meet final visual inspection criteria.
- I. When final visual inspections are required, the CONTRACTOR shall notify OWNER and the OWNER REPRESENTATIVE, in writing, 24 hours in advance of the day and time when the CONTRACTOR will complete work.
- J. The OWNER REPRESENTATIVE's role in advising OWNER on environmental health matters does not relieve the CONTRACTOR's obligation to comply with all applicable health and safety regulations promulgated by the federal, state, or local governments. Air monitoring results generated by the OWNER REPRESENTATIVE shall not be used by the CONTRACTOR to represent compliance with regulatory agency requirements for monitoring of workers exposure to airborne asbestos, nor shall any other activity on the part of the OWNER REPRESENTATIVE represent the CONTRACTOR's compliance with applicable health and safety regulations.

### **1.9 Personnel Protection**

- A. Prior to the commencement of work, the workers shall be instructed and be knowledgeable in the use and limitations of personal protective equipment.
- B. Respiratory Protection
- The CONTRACTOR shall comply with 8 CCR 1519 and 8 CCR 5144 (Respiratory Protection) and ANSI Standard Z88.2-1980 "Practices for Respiratory Protection" as amended herein.
  - The criteria for selection of respiratory protection shall be as described in 8 CCR 1529.
  - Workers shall be provided, as a minimum, with personally issued and marked respirators equipped with high efficiency particulate air (HEPA) filters approved by NIOSH to be worn in the designated work area and/or whenever a potential exposure to asbestos exists. Sufficient filters and respirator replacement parts shall be provided for replacement as required by either the workers or applicable regulations. Disposable respirators shall not be used.

- No worker shall be exposed to levels greater than 0.1 f/cc as determined by the protection factor of the respirator (as defined in 8 CCR 1529) worn and the work area fiber levels.
- During encapsulation operations or other usage of organic solvent based materials (e.g., chemical strippers, spray glue, expanding foam), workers shall be provided with combination organic vapor/HEPA filter respirator cartridges, or other acceptable alternative respiratory protection.
- The CONTRACTOR shall require daily inspection(s) of all respirators to verify cleanliness and to replace damaged, worn or missing parts.

C. Protective Clothing:

- Whenever potential exposures may exceed the Cal/OSHA PELs, workers shall be provided with sufficient sets of protective full-body clothing to be worn in the regulated work area. Such clothing shall include, but not be limited to: full-body coveralls, headgear, eye protection, and gloves. Disposable-type protective clothing and footwear may be provided.
- Workers shall assure that hoods covering their hair are worn in the regulated work areas at all times. Protective clothing shall not be worn in lieu of street clothing outside the work area. Non-disposable-type protective clothing and footwear shall be left in the washroom until the end of the asbestos abatement work. An acceptable alternative to disposal is proper storage in a sealed and labeled container, such that containers would be opened and clothing reused only in an asbestos work area.
- Eye protection shall be provided and worn as required by applicable safety regulations. Eye protection shall be worn at all times within the asbestos work areas during all phases of work: preparation, removal, cleanup, encapsulation, waste handling, etc. If appropriate based on regulatory mandates, a full face piece respirator may be worn to satisfy this requirement. Equipment shall conform with ANSI Z87.1-1979.
- Hard hats or other head protection shall be provided as required by applicable safety regulations. If worn, hard hats shall conform with ANSI Z89.1-1981, Class A or B.
- Nonskid footwear shall be provided to all abatement workers. Footwear shall conform to ANSI Z41.1-1983, Class 75.

D. Visitor PPE and Clothing:

- The CONTRACTOR shall provide any authorized visitor, Consultant or other CONTRACTORS requiring access to the work area with protective clothing, headgear, eye protection, and footwear as described herein, whenever he enters the work area.

E. Decontamination and Work Procedures:

- The decontamination and work procedures to be followed by workers shall be posted, as described in these specifications.

F. Worker and Authorized Visitor Protection Procedures:

- Each worker and authorized visitor shall, upon entering the job site, remove street clothes in the clean change room and put on a respirator with new filters and clean protective clothing before entering the work area. All entrants to the work area shall sign in legibly at the time of entry on a daily work log posted at the entrance to the work area.
- The CONTRACTOR's employees shall perform a positive/negative respirator fit test (on negative pressure respirators) each entry into the work area. If leakage occurs, the respirator must be readjusted or replaced.



- Workers shall maintain their respirators. Condition of all respirator parts shall be checked daily, and they shall be replaced when necessary.
- Each time a worker or authorized visitor leaves the work area, he shall remove gross contamination from clothing before leaving the work area, proceed to the decontamination room and HEPA vacuum all clothing before removal. Thereafter, the individual shall follow the required hygiene procedures before leaving the area.
- Workers shall not eat, drink, smoke, or chew gum or tobacco in or near the asbestos work areas or decontamination enclosure system. These activities are permitted in areas designated by the OWNER REPRESENTATIVE. Smoking will not be permitted in the clean room and near storage or usage areas of flammable materials, such as spray adhesive.
- CONTRACTOR shall conduct daily personal air samples (excursion limit and 8-hour time-weighted average) for all abatement activities inside the building during this project. Monitoring may be discontinued with OWNER REPRESENTATIVE's written approval provided the data meets the requirements for a negative exposure determination as defined in 8 CCR 1529. Personal air monitoring shall be conducted in accordance with methods described in 8 CCR 1529. Air monitoring shall not be required if CONTRACTOR opts for Type C respiratory protection.
- Results of personal air samples (excursion limit and 8-hour time-weighted average) collected by the CONTRACTOR shall be made available by the following work shift but in no case later than 48 hours after sample collection for the first three days of each of the abatement phases, unless otherwise waived by the OWNER REPRESENTATIVE. Personal air samples shall be analyzed by a laboratory which participates in the NIOSH Proficiency Analytical Testing (PAT) Program. Results submitted shall include employee name, social security and activity while monitored. The results shall also be posted at a conspicuous location for site employees.

#### **1.10 Disposal Activities**

- A. The CONTRACTOR shall comply with current Federal, State, and local regulations concerning the waste handling, transportation, and disposal of ACM and other wastes generated during this project.
- B. The CONTRACTOR shall document actual disposal of the waste at the designated landfill by completing and submitting uniform Hazardous Waste Manifests and Bills of Lading as appropriate.
- C. Owner shall provide the CONTRACTOR a U.S. EPA Hazardous Waste Generator ID Number, and other pertinent details, for transportation and disposal. Owner shall sign hazardous manifest, as needed.
- D. The owner shall designate an area for temporary ACM waste storage. A suitable storage facility shall be provided by the CONTRACTOR within the designated area. All ACM waste shall be stored within the temporary facility. Proper signage shall be posted clearly indicating the facility is for ACM waste only.

#### **1.11 Waste Disposal**

- A. Owner shall provide the CONTRACTOR a U.S. EPA Hazardous Waste Generator ID Number, and other pertinent details, for transportation and disposal. Owner shall sign hazardous manifest, as needed.

- B. The owner shall designate an area for temporary ACM waste storage. A suitable storage facility shall be provided by the CONTRACTOR within the designated area. All ACM waste shall be stored within the temporary facility. Proper signage shall be posted clearly indicating the facility is for ACM waste only.

## **PART TWO: MATERIALS AND EQUIPMENT**

### **2.1 Materials**

- A. Deliver all materials in original packages, containers, or bundles bearing the name of the manufacturer and the brand name.
- B. Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.
- C. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Materials that become contaminated shall be disposed of in accordance with applicable regulations.
- D. Chemical Strippers (if used) shall not contain methylene chloride compounds.
- E. Polyethylene sheeting shall be flame retardant and approved and listed by the State Fire Marshal per Section 13121 and/or 13144.1 of the California Health and Safety Code. All polyethylene sheeting shall be 6-mil minimum thickness, unless otherwise specified. Polyethylene sheeting shall be sized to minimize the frequency of joints. Flame retardant polyethylene shall comply with National Fire Protection Association Standard 701 Small Scale Fire Test For Flame Resistant Textiles and Films with a flame spread rating of no greater than five (5) and a smoke development rating of no more than 70 when tested in accordance with ASTM E-84 procedures.
- F. Tape, 2" or wider, shall be capable of sealing joints of adjacent sheet of polyethylene and shall attach polyethylene sheet to finished or unfinished surfaces of similar materials. Tape shall be capable of adhering under dry and wet conditions, including use of amended water.
- G. Sealable labeled polyethylene bags of 6 mil minimum thickness shall be used for asbestos disposal.
- H. Spray adhesive shall be capable of sealing joints of polyethylene to polyethylene.
- I. Provide protective devices such as, but not limited to, disposable clothing, respirators, gloves, hard hats, shoes, etc. Protective equipment shall conform to ANSI standards where standards exist.
- J. Wetting agent or surfactant shall effectively wet and be compatible with the ACM being wetted.
- K. Encapsulant materials shall be either bridging or penetrating type and shall conform to the following characteristics:
  - Encapsulants shall be water based. They shall not utilize an organic solvent in which the solid parts of the encapsulant are suspended
  - Encapsulants shall not be flammable or toxic.
- L. Materials and equipment shall be delivered progressively to the site so that there will be neither delays nor an accumulation of material that is not to be used within a reasonable time.

## 2.2 Tools and Equipment

- A. Provide suitable tools for removal of asbestos-containing materials. Metal wire brushes shall not be used as a means of removing or cleaning asbestos-containing materials from surfaces.
- B. Provide sufficient number of HEPA-filtered vacuum cleaners equipped with wet pick-up adapters, steel floor wands, crevice tools, and carpet tools.
- C. Airless sprayers capable of spraying amended water shall be provided in sufficient number to allow continuous uninterrupted work. Airless sprayers shall not deliver more than 0.5 gallons per hour at 500 to 2500 psi pressure (similar to Speedaire Model 4Z242 or 7Z609, Binks Model 3Z816, or approved equivalent).
- D. Air filtration devices to be used onsite must be High Efficiency Particulate Air (HEPA) certified to be 99.97 percent or more efficient in removing 0.3  $\mu\text{m}$  diameter particles. Efficiency shall be tested onsite by a third party. Asbestos filtration devices shall utilize high efficiency particulate absolute (HEPA) filtration systems bearing a UL 586 label indicating its ability to perform under specified conditions. Provide filters marked with the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of the test air flow. Units shall have two stages of prefiltering, as follows:
  - The first stage prefilter shall be a low efficiency type for particle sizes 100 micrometers and larger.
  - The second stage prefilter shall be a medium efficiency type effective for particle sizes down to 5 micrometers.
  - Prefilters shall be installed either on or in the intake grid to the exhaust unit and shall be held in place with special housings or clamps.
- E. HEPA-filtration exhaust units shall also include:
  - An elapsed time meter showing the total accumulated hours of operation.
  - An electrical interlock preventing operation of the unit without a HEPA filter.
  - An automatic shutdown system to stop the fan in the event of a rupture in the HEPA filter or a blocked air discharge.
  - Warning lights to indicate normal operation (green), moderately high pressure drop across the filters, such as due to filter overloading (yellow), and too high of a pressure drop due to an overloaded or ruptured HEPA filter or obstructed discharge (red).
  - An audible alarm if the unit shuts down due to operation of the safety systems.
  - Electrical components approved by the National Electrical Manufacturers Association (NEMA) and the Underwriter's Laboratories (UL). Each unit shall be equipped with overload protection sized for the equipment. The motor, fan, fan housing, and cabinet shall be properly grounded.
- F. The CONTRACTOR shall provide a suitable quantity of spare HEPA-filtered exhaust units. The spare units shall be kept on site and used as needed should active units fail.
- G. Transportation Equipment: Transportation equipment, as required, shall be suitable for loading, temporary storage, and unloading of contaminated waste without exposure to persons or property, and shall be quiet in motion if used within the building.

- H. Provide dry-type fire extinguisher minimum classification 2-A:20-B:C, U.L. listed, within the work area as required by local ordinance. Inspect fire extinguishers every 30 days and tag accordingly. Provide suitable fire alarms to notify workers in building of fire emergencies.
- I. Lighting shall be fluorescent type lighting, rated for wet environments and shall meet OSHA and NEC minimum requirements for temporary lighting on construction sites.
- J. Prohibitions. The following are specifically prohibited for use on this project unless accepted in writing by the OWNER REPRESENTATIVE:
- Gasoline, propane, diesel or other fuel powered equipment inside the building, unless previously approved in writing by OWNER and the OWNER REPRESENTATIVE.
  - Equipment that creates excessive noise or vibration that would affect safety of the building or CONTRACTOR employees or authorized visitors. No equipment shall exceed an A-weighted sound level of 85 dB as measured at 3 ft. from the radiating source without written permission of the OWNER REPRESENTATIVE.
  - Flammable solvents with a flash point below 140° F.

## **PART THREE: EXECUTION**

### **3.1 General Information**

#### **A. Pre-Startup Safety Meeting:**

- Prior to the beginning of on-site work, all CONTRACTOR employees shall attend a pre-startup safety meeting conducted by the CONTRACTOR that addresses at least the following issues specific for this project:
  - safety and health hazards;
  - entry and work within proximity to occupied units;
  - noise/vibration expectations;
  - personal protective measures and decontamination system requirements;
  - respiratory protection program;
  - specific asbestos abatement practices and procedures;
  - emergency procedures, including escape routes, muster points and fire alarms;
  - asbestos and non-asbestos waste handling practices and procedures; and
  - internal administrative and inspection procedures.
- The agenda of the pre-startup meeting(s), date(s) and time(s) of meetings, and list attendees shall be provided to OWNER/OWNER REPRESENTATIVE prior to the start-up.

#### **B. Coordination with Owner:**

- Work activities shall occur during designated hours to be determined (TBD). Activities outside working time frame shall be approved by OWNER with written notification of the hours, planned activities and required number of workers provided to the OWNER REPRESENTATIVE.
- Coordinate security, fire and life safety and access restrictions, as applicable, with OWNER and local jurisdictional agencies, as required. Identify an individual responsible for fire department liaison and life-safety system coordination.

### **3.2 Security**

- A. The Abatement CONTRACTOR shall provide building security and coordinate this with OWNER. The CONTRACTOR shall be responsible for assuring there are no trespassers into the building for the duration of the work and for any necessary security improvements found necessary during the course of the work.
- B. Building access outside work hours shall be locked. Keys shall be provided to OWNER and OWNER REPRESENTATIVE.
- C. After the building has been secured, CONTRACTOR shall post the required asbestos work area notice as specified in 8 CCR 1529 at all entrances to active asbestos work areas. All work in these areas thereafter shall be conducted in the appropriate personal protective equipment.

### 3.3 Power and Lighting

- A. The OWNER will provide building power and water. The CONTRACTOR shall ensure safe use and equipment per applicable electrical code requirements and provide safety lighting and ground fault interrupter circuits as required.
- B. CONTRACTOR's lighting shall contain manufacturer's approved safety guards or lenses to reduce accidental exposure of workers to this heated source and the potential of fire hazard from objects coming in direct contact with the lamp. Lighting locations shall be fixed or located to prevent damage from tripping and contact with polyethylene surfaces.
- C. All electrical services shall be physically inspected periodically to guard against overheating of sources. Corrective measures shall be taken as warranted.
- D. All equipment within the work zone and decontamination systems shall be fully grounded. Use of ungrounded plugs is unacceptable and shall be removed and replaced upon the OWNER REPRESENTATIVE's instructions.
- E. Unless otherwise approved by the OWNER REPRESENTATIVE, the CONTRACTOR shall use only grounded extensions cords (use "hard-service" cords where exposed to abrasion and traffic). The CONTRACTOR shall use single lengths or waterproof connectors to connect separate lengths (if single lengths do not reach work areas). Exposed temporary extension cords shall consist of Tyrex cord terminated in suitable connectors or weatherproof junction boxes, subject to the approval of the OWNER REPRESENTATIVE. Either suitably grounded or double insulated electrically powered tools may be used.

### 3.4 Preparation of Critical Barriers

- A. Temporary isolation partitions, tunnels, and other critical barriers shall be constructed as follows:
  - Construct critical barriers with minimum thickness 6 mil polyethylene sheet with joints staggered and sealed with tape, unless otherwise directed by the OWNER REPRESENTATIVE. Edges of partition at floors, walls, and ceilings shall be caulked airtight. Barrier shall be airtight and adequately braced for lateral loads.
  - Seal off all openings, including but not limited to corridors, doorways, windows, ducts, grills, diffusers, pipe chases, drains, grates, and any other penetrations of the work areas, with polyethylene sheeting sealed with tape. Use caulking where necessary.
  - At any time during the abatement activities after barriers have been erected, if visible suspect material is observed outside of the work area or if damage occurs to barriers, work in the asbestos abatement area shall immediately stop. Repairs will then be made to barriers, and debris/residue shall be cleaned using appropriate HEPA vacuuming and wet cleaning procedures.
  - Provide clear Plexiglas viewing windows, two feet by two feet, for each Class I and Class II contained work area. The windows shall be located as directed by OWNER REPRESENTATIVE and shall be kept unobstructed at all times so that observations may be made of the work progress without entering the work area.
  - Post access to work areas with warning signs as specified in 8 CCR 1529. Signs shall be multilingual.
- B. CONTRACTOR project supervisor or designee shall conduct periodic inspection of work enclosures and shall provide documentation that it is in intact condition with any noted

deficiencies corrected. Documentation of CONTRACTOR work area inspections shall be maintained on site, and shall be available for inspection.

### 3.5 Negative Pressure Enclosure

- A. Establish regulated work area with negative pressure enclosure system with exhaust air ducted outside the building for areas from which friable asbestos is to be abated. Sufficient ventilation shall be provided to allow 4 air changes per hour and -0.020 inches water gage of differential air pressure in the work areas. Exhaust air shall be HEPA filtered discharged outside the building and DOP tested onsite prior to use by an independent testing firm.
- B. The CONTRACTOR shall provide a record of adequate pressure differential in the work area relative to each which friable asbestos is to be removed (-0.020 inches water gauge). This pressure differential must be maintained at all times. Provide an adequate number of exhaust units to allow for any pressure differential losses or fluctuation. Locate unit(s) so that air flow leads away from work area entrances and traverses the work area as much as possible.
- C. The CONTRACTOR shall install electronic manometer to verify negative pressure differential. Negative pressure is to be maintained at all times until removal work and clearance is complete.
- D. The CONTRACTOR will maintain spare filters and air exhaust units on-site to ensure steady, uninterrupted progress of the work.
- E. After the abatement has begun, units shall run continuously to maintain a constant pressure differential and air circulation until the area has been cleared. Do not turn off at the end of the work day or abatement phase. Do not shut down units during the encapsulation process or at any time without written authorization by the OWNER REPRESENTATIVE.
- F. CONTRACTOR project supervisor or designee shall conduct periodic inspection of work enclosures and shall provide documentation that it is in intact condition with any noted deficiencies corrected.

### 3.6 Preparation of Decontamination System

- A. Construct a decontamination enclosure system (as a minimum) in work requirements as described in 8 CCR 1529 for Class I and Class II work areas. In general, decontamination chambers shall consist of a single stage decon fitted with a HEPA vacuum cleaner to vacuum off protective clothing before removing it. This system shall consist of a single temporary room constructed adjacent to the work area.
  - Chamber walls sheeting shall be of 6-mil thickness and placed a minimum of 1 1/2 inches apart. The CONTRACTOR may propose alternative methods to be evaluated by OWNER REPRESENTATIVE.
  - Chamber floor sheeting shall be of 15-mil thickness and shall extend up the walls a minimum of 12 inches.
  - Access shall be through a curtained doorway constructed by placing two layers of polyethylene sheets overlapping at least three feet over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Curtained doorways shall be weighted with a flexible/conformant material at the base so as to limit the ingress of air into the work area. Suitable washing facilities and adequate supplies shall be placed and maintained in each decontamination chamber.



- All chambers must be kept in a clean and sanitary condition at all times. Accumulation of used materials, debris, and other non-sanitary conditions will not be permitted.

### 3.7 Regulated Work Area

- A. All asbestos abatement work shall be conducted within a regulated work area, and shall be supervised by a Competent Person.
- B. The regulated work area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the work area from asbestos exposure.
- C. Regulated work areas shall be posted with the following:

**DANGER  
ASBESTOS  
CANCER AND LUNG DISEASE  
AUTHORIZED PERSONNEL ONLY  
RESPIRATORS AND PROTECTIVE CLOTHING ARE  
REQUIRED IN THIS AREA**

- D. Signs shall also be posted in Spanish.
- E. Access into and out of the regulated work area shall be via the decontamination chamber. CONTRACTOR shall maintain a log of all entrants to the regulated work area until it has been cleared by OWNER REPRESENTATIVE.
- F. Eating, drinking and smoking shall be prohibited in the regulated work area.
- G. All persons within the regulated work area shall, as a minimum, wear half face air purifying respirators fitted with N-100 filters and whole-body coveralls.

### 3.8 Work Area Inspections

- A. All inspection requests shall be preceded by an evaluation by the CONTRACTOR's project supervisor who shall verify that criteria for acceptability have been met prior to requesting it.
- B. The CONTRACTOR's Project supervisor shall provide in writing a signed or initialed request for visual inspection to OWNER and OWNER REPRESENTATIVE. All inspections shall be requested at least 24 hours in advance of the time the inspection is required. Written requests may be waived and verbal requests accepted for short-duration projects at the discretion of the OWNER REPRESENTATIVE.
  - Work Area Preparation Inspection(s):
    - After preparation of the work area and decontamination enclosure system(s), the OWNER REPRESENTATIVE shall conduct an initial inspection to ensure completeness of work and containment according to the requirements of this specification.
    - No abatement operations shall commence without the approval of the OWNER REPRESENTATIVE following a work area preparation inspection.
  - Inspections
    - The OWNER REPRESENTATIVE shall conduct routine visual inspections during asbestos abatement to verify gross cleanup of material removed. No further abatement may proceed until the work area has been satisfactorily cleaned. The OWNER REPRESENTATIVE shall also inspect abated surfaces to ensure they have been

satisfactorily cleaned. Inadequately abated surfaces shall be tagged for completion during the following shift.

- Final Visual Inspection and Clearance Sampling:
  - After the asbestos abatement has been completed and after all ACM debris bags, tools, supplies, and equipment have been removed from the work area, the OWNER REPRESENTATIVE shall inspect the work area to verify the cleanliness of the area. The work area must be free of visible debris, dust, water, or other suspect three dimensional residues of asbestos-containing material. After visual inspection, encapsulant may be applied (as applicable).
  - Clearance air sampling may be conducted at the discretion of the OWNER'S REPRESENTATIVE. Methods may include, aggressive sampling and transmission electron microscopy (TEM) or phase contrast microscopy (PCM) analysis, per AHERA protocol. Areas are considered acceptable if all samples' results are less than 70 structures per square millimeter (s/mm<sup>2</sup>) or 0.01 fibers per cubic centimeter (f/cc).

C. Work Area Observations:

- Throughout the abatement operations, the OWNER REPRESENTATIVE may conduct work area observations to document the work practices employed by the CONTRACTOR.
- All items demonstrating non-compliance shall be submitted in writing to OWNER and the CONTRACTOR.
- No written notification is required prior to initiating work area observations.

### 3.9 Abatement Work Areas Sequence of Events

- A. This section outlines the general sequence of asbestos abatement events only. Refer to other applicable sections of this specification for detailed requirements.
- Work Area Preparation:
    - Isolate the work area as required to establish regulated area.
    - Construct decontamination enclosure systems.
    - Request and secure a work area preparation inspection from OWNER REPRESENTATIVE.
  - B. Remove asbestos-containing materials employing wet cleaning methods, HEPA vacuuming and proper work practices.
  - C. Clean up work area daily. All loose asbestos containing wastes shall be placed in sealed labeled leak proof containers by the end of each work shift.
  - D. Dispose appropriately of asbestos-containing waste.
  - E. Final clean-up work area, as specified.
  - F. Allow for visual inspections and apply encapsulation as required.
  - G. Upon clearance remove CONTRACTOR supplies, final critical barriers and any other CONTRACTOR wastes.

### 3.10 Removal of Asbestos-Containing Materials

This section provides guidelines for the removal of asbestos containing materials at the facility. The CONTRACTOR may provide written alternative abatement methods provided they are cost effective and

are consistent with applicable regulations. Alternative abatement methods may not be used unless specifically approved in writing by Owner or OWNER REPRESENTATIVE.

#### A. General

The following work practices shall apply to all asbestos removal work and associated cleanup:

- All material to be removed shall be thoroughly wetted before removal, and shall be kept wet until it has been placed into sealed, labeled impermeable containers.
- All asbestos removal work shall take place within a posted regulated area
- HEPA filtered vacuum cleaners shall be used to collect all debris and dust either containing asbestos or suspected to contain asbestos. HEPA filtered vacuums that discharge into the building shall be D.O.P. equivalent tested on site.
- All asbestos containing wastes and debris shall be cleaned up and placed into labeled leak-tight containers promptly and no later than at the conclusion of each work shift. Containers shall be sealed at the end of each work shift.
- Minimum respiratory protection for all asbestos work shall consist of half face air purifying respirators fitted with N-100 filters.
- Minimum personal protective clothing shall consist of full body disposable coveralls for all asbestos abatement work. These coveralls shall be replaced daily or whenever they rip or tear.

#### B. Prohibitions

The following work practices shall be prohibited for to all asbestos removal work and associated cleanup:

- The use of high-speed abrasive saws unless they have been fitted with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- Compressed air to remove asbestos, or materials suspected to contain it, unless the compressed air system is used within an enclosure designed to capture the dust cloud created by compressed air use.
- Dry sweeping, shoveling or other dry clean up of dust that either contains asbestos or is suspected to contain it.
- Employee rotation as a means of reducing employee exposure to asbestos.
- Eating, drinking or smoking in any regulated work area.

#### C. Removal of Spray Applied Acoustical Ceiling

- BAAQMD regulates air emissions from building demolition and renovation projects. This agency requires that materials with an asbestos content greater than 1% be removed before building demolition. We found RACM (acoustical ceiling) at the Site. The removal of RACM requires 10-day advance notification to BAAQMD if more than 100 square feet or 100 linear feet are removed. Even if less than 100 square feet or linear feet are removed, the BAAQMD has rules regarding the methods of removal.
- This work shall take place within regulated negative pressure enclosure that shall consist of double six mil polyethylene critical barriers fitted with viewing ports. This enclosure shall be maintained under negative pressure of -0.02 inches of water pressure using HEPA filtered equipment until abatement has been completed and work area has been cleared by the OWNER REPRESENTATIVE.
- Access into and out of the regulated area shall be via a three-stage decontamination chamber.

- Waste bags shall be immediately placed into a secondary six mil labeled asbestos waste bag.
- The friable RACM shall be disposed of as hazardous waste.

### 3.11 Daily Cleaning

- A. Asbestos-containing debris and contaminated water shall be cleaned from the work area daily using wet methods and HEPA vacuuming equipment. Asbestos debris and water shall be placed in bags, sealed and either stored or removed from the work area. No significant ACM debris will be allowed to remain on work area floors at the completion of each shift. Abated surfaces are to be cleaned to final visual inspection criteria each day.
- B. Worker decontamination enclosure system: decontamination room shall be cleaned daily or as required more frequently to maintain acceptable clean room perimeter air sample total fiber counts. Clean room floor shall be kept dry and free of any waste. Clean room flaps shall be repaired or replaced whenever damaged or torn.

### 3.12 Final Clean-Up and Clearance

- A. Remove all visible accumulations of asbestos material, debris and dust from within each work area and its decontamination enclosure systems. Clean all surfaces within the work area.
- B. The CONTRACTOR's Supervisor shall perform a complete visual inspection of work areas under adequate lighting to ensure that the work area is free of visible asbestos material, debris, and dust. The supervisor shall ensure that additional cleaning is completed if the area is not acceptably clean. The supervisor shall submit a request in writing for a final inspection by the OWNER REPRESENTATIVE after the work area is acceptable for a final visual inspection and aggressive clearance sampling.
- C. The OWNER REPRESENTATIVE shall verify the cleanliness of the work area by conducting a final clearance inspection. If any visible suspect asbestos material, debris, dust, three dimensional suspect residues, or water is found in the work area, the CONTRACTOR shall repeat the final cleaning process as prescribed herein for all or part of the work area as directed by the OWNER REPRESENTATIVE. Additional cleaning shall be at CONTRACTOR's expense.
- D. CONTRACTOR shall be authorized to remove the critical barriers, decontamination enclosure systems, and air exhaust systems if OWNER REPRESENTATIVE's visual inspection reveals no suspect three-dimensional residual asbestos containing materials.
- E. After the CONTRACTOR has completely removed equipment and materials from the work area, the OWNER REPRESENTATIVE and CONTRACTOR shall conduct an inspection of the area to ensure it is in an acceptable condition.

### 3.13 Handling and Disposal of Asbestos-Contaminated Waste

- A. Bagging, Drumming, and Handling Waste:
  - All asbestos wastes shall be placed into double six mil labeled bags for disposal. Each waste bag or container shall be labeled with the name of the waste generator, and location of project site before it is removed from the work area.
  - Asbestos waste shall not be allowed to dry out prior to sealing bags.
  - Bags of asbestos-containing waste shall be sealed with tape in the work area. Bags shall be sealed with a goose neck fold: first twist bag and seal top opening with tape; fold remaining bag extension over the first tape enclosure and re-taped around top of bag - thereby double

sealing the top opening. No free-flowing water shall be present at any time in the bag. If free-flowing water is present, the CONTRACTOR shall add absorbent into the bags to remedy the condition.

- All vehicles used to transport asbestos wastes shall be labeled with the following signs during the loading and unloading of the wastes:

**DANGER  
ASBESTOS  
MAY CAUSE CANCER  
CAUSES DAMAGE TO LUNGS  
AUTHORIZED PERSONNEL ONLY**

This sign shall be displayed such that it is visible and can be readily seen.

- Alternate waste handling methods may be proposed in writing for OWNER REPRESENTATIVE approval before use.
- B. Transportation of Waste: The CONTRACTOR shall ensure that the sealed waste containers are transported to a waste disposal site approved by the OWNER. Non-friable asbestos wastes shall be transported to a site permitted to accept such wastes. CONTRACTOR shall provide evidence of suitability of such sites for waste acceptance.
- C. Waste Manifest System:
- The CONTRACTOR shall establish a manifest system that accounts for all asbestos waste classified as hazardous waste. The manifest system shall be described in writing and will be subject to the approval of the OWNER REPRESENTATIVE. The CONTRACTOR must be able to demonstrate custody over all asbestos waste from the time it is removed from the work area until it is deposited at the landfill. Non hazardous asbestos containing wastes shall be tracked through a bill of lading system.
  - Copies of the written description, the manifest, bills of lading and any receipts generated during the handling and disposal process shall be provided to the OWNER REPRESENTATIVE and OWNER before project closure.
  - Final manifests, bills of lading and documents must be provided to the OWNER REPRESENTATIVE and OWNER within three (3) working days of the removal of asbestos materials from the site by the waste hauler.
  - Owner shall provide EPA Hazardous Waste Identification number for CONTRACTOR Use. Owner shall sign hazardous waste manifests before transportation off site.
  - All friable asbestos waste containers shall be labeled as follows:

**DANGER  
Contains Asbestos Fibers  
Avoid Creating Dust  
Cancer and Lung Disease Hazard  
Avoid Breathing Asbestos Fibers**

**HAZARDOUS WASTE**

**STATE AND FEDERAL LAW**

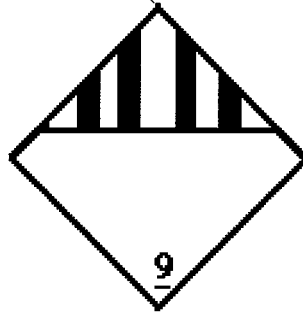
**PROHIBIT IMPROPER DISPOSAL  
IF FOUND, CONTACT THE NEAREST  
POLICE OR PUBLIC SAFETY  
AUTHORITY OR THE CALIFORNIA  
DEPARTMENT OF  
TOXIC SUBSTANCES CONTROL**

**Generator's Name:** (to be inserted)

**Address:** (to be inserted)

**Manifest:** (to be inserted)

**RQ, Asbestos, 9, NA 2122**  
followed by DOT Diamond (Class 9 Hazardous Materials)



Non friable asbestos waste containers shall be similarly labeled except that the hazardous waste statement shall be deleted.

**3.14 Project Closeout**

- A. Prior to the final payment CONTRACTOR shall provide all documentation required in this specification including but not limited to all CONTRACTOR project inspection records, all project employee exposure monitoring data, all waste shipment records as required by BAAQMD, records of agency inspections and their outcomes (if applicable), accident investigation records (if applicable).

**\*\*\* END OF SECTION \*\*\***

**WILLARD PARK CLUBHOUSE AND RESTROOM REPLACEMENT PROJECT  
BERKELEY, CALIFORNIA**

**APPENDIX K  
CITY OF BERKELEY COMMUNITY  
WORKFORCE AGREEMENT (CWA)**

**CITY OF BERKELEY**  
**COMMUNITY WORKFORCE AGREEMENT**



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**COMMUNITY WORKFORCE AGREEMENT**  
**For the**  
**City of Berkeley**

This Agreement is made and entered into retroactively from July 1, 2020, by and between the City of Berkeley (“City”) together with other contractors and/or sub-contractors, who shall become parties to this Agreement by signing the “Agreement to be Bound” (Attachment A), and the Local Unions signatory hereto and the Alameda County Building & Construction Trades Council (“Council”) and its affiliated local unions who have executed this Agreement.

**PURPOSE**

The purpose of this Agreement is to support the efforts of the City to increase employment opportunities for workers who reside in Berkeley, to help increase training and employment opportunities for Berkeley residents in the construction trades through apprenticeship and pre-apprentice programs as the students graduate from the City's schools, to promote efficiency of construction operations performed for and within the City of Berkeley and to provide for peaceful settlement of labor disputes and grievances without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the projects.

**RECITALS**

WHEREAS, the successful completion of the City's construction projects is of the utmost importance to the City of Berkeley; and

WHEREAS, the interests of the general public, the City, the Unions and Contractor(s) would be best served if the construction work proceeded in an orderly manner without disruption because of strikes, sympathy strikes, work stoppages, picketing, lockouts, slowdowns or other interferences with work; and

WHEREAS, the Contractor(s) and the Unions desire to mutually establish and stabilize wages, hours and calendar conditions for the workers employed on construction work for and within the City of Berkeley by the Contractor(s), and further, to encourage close cooperation among the Contractor(s) and the Union(s) to the end that a satisfactory, continuous and harmonious relationship will exist among the parties to this Agreement; and

WHEREAS, contracts for construction work within the City of Berkeley will be awarded in accordance with the applicable provisions of the Charter of the City of Berkeley, the California State Public Contract Code and the Labor Code, including but not limited to requiring competitive bidding and prevailing wages; and

WHEREAS, the City of Berkeley has the absolute right to select the lowest responsive and responsible bidder for the award of the construction contracts on the Projects; and

WHEREAS, the parties signatory to this Agreement pledge their full good faith and trust to work towards a mutually satisfactory completion of the Projects;

NOW, THEREFORE, IT IS AGREED BETWEEN AND AMONG THE PARTIES HERETO, AS FOLLOWS:

**ARTICLE 1**  
**DEFINITIONS**

1.1 "Agreement" means this Community Workforce Agreement.

1.2 "Berkeley Resident" means any individual who is a current resident of Berkeley can certify through a utility bill, or other similar means acceptable to the parties to this Agreement that the individual resides within the boundaries of the Berkeley City Limits.

1.4 "City" means the City of Berkeley.

1.5 "Completion" means that point at which the City accepts a project at issue by filing a Notice of Completion, or as otherwise provided by applicable state law. "Punch list" items and any other work within the scope of this Agreement not completed prior to commencement of revenue service shall nonetheless be included within the scope of this Agreement. It is understood by the parties that portions of the Projects may be completed in phases and Completion of any such phase may occur prior to Completion of the Projects.

1.6 "Contractor(s)" and/or "Subcontractor(s)" means any individual, firm, partnership or corporation, or combination thereof, including joint ventures, which is an independent business enterprise and has entered into a contract with the City or any of its contractors or subcontractors of any tier, with respect to the construction work necessary for any part of the Projects. This shall include subcontractors not required to be listed in the bid documents. As applicable depending on its context, "Contractor" shall refer to Contractor or Contractor and Subcontractor.

1.7 "Construction Contract(s)" means all of the contract(s) for construction of any of the Projects.

1.8 "Council" means the Alameda County Building and Construction Trades Council, AFL-CIO.

1.9 "New Apprentice" is a Berkeley Resident who is enrolled in a State of California approved apprenticeship program that is a joint labor management apprentice program for no more than twenty-four months

1.11 “Projects” mean any construction project of the City whose value as estimated by the City meets or exceeds \$500,000 (Five hundred thousand) dollars.

1.12 “Union” or “Unions” means the Council and any other labor organization signatory to this Agreement, acting on their own behalf and on behalf of their respective affiliates and member organizations whose names are subscribed hereto and who have through their officers executed this Agreement.

1.13 “Project Manager” means the person or persons or business entity designated by the City to oversee all phases of construction on the Projects.

1.14 “Master Labor Agreement” or “MLA” shall mean the collective bargaining agreement of each craft Union that is Signatory to this Agreement

1.15 “Calendar Day” shall mean any day, relating to any day of the week including Saturday, Sunday and public holidays.

1.16 “ Apprenticeship Program” -Recognizing the need to develop adequate numbers of competent workers in the construction industry, the Contractor(s)/Employer(s) shall employ apprentices of a California State-approved Joint Apprenticeship Program in the respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured.

The apprentice ratios will be in compliance with the applicable provisions of the applicable “Master Labor Agreement”.

## **ARTICLE 2**

### **SCOPE OF AGREEMENT**

21 Parties: This Agreement shall apply and is limited to all Contractors and subcontractors performing Construction Contracts necessary for the Projects, the City, the Council and any other labor organization signatory to this Agreement, acting in their own behalf and behalf of their respective affiliates and member organizations whose names are subscribed hereto and who have through their officers executed this Agreement.

22 Project Description: This Agreement shall govern the award of all of the Construction Contracts identified by the City as part of the Projects. The City has the absolute right to combine, change, consolidate, suspend or cancel Construction Contract(s) or portions of Construction Contract(s) identified as part of the Projects. Should the City suspend or remove any contract from the Projects and thereafter authorize that construction work be commenced on such contract, then such contract shall be performed under the terms of this Agreement. Once a Construction Contract is completed it is no longer covered by this Agreement except when a Contractor is directed to engage in repairs, warranty work or modifications required by its

Construction Contract with the City. For the purposes of this Agreement, a Construction Contract shall be considered Completed as set forth in Section 1.5 of this Agreement.

### 23 Covered work:

2.3.1 This Agreement covers, without limitation, all on-site construction, demolition, alteration, painting or repair of buildings, structures, landscaping, temporary fencing and other works and related activities for the Projects that is within the craft jurisdiction of one of the Unions and that is part of the Projects, including, without limitation, pipelines, site preparation, survey work, demolition of existing structures and all construction, demolition or improvements required to be performed as a condition of approval by any public agency. This scope of work includes all soils and materials testing and inspection where such testing and inspection is a classification in which a prevailing wage determination has been published.

2.3.2 The Projects include work necessary for the Projects and/or in temporary yards or areas adjacent to and dedicated to the Projects, and at any on-site batch plant(s) constructed solely to supply materials to the Projects, when those sites are dedicated exclusively to the Projects. This Agreement covers all on-site fabrication work over which the City, Contractor(s) or subcontractor(s) possess the right of control (including work done for the Projects in any temporary yard or area established for the Projects.)

2.3.3 The furnishing of supplies, equipment or materials which are stockpiled for later use shall in no case be considered subcontracting. Construction trucking work, such as the delivery of ready-mix, asphalt, aggregate, sand or other fill material which are directly incorporated into the construction process as well as the off-hauling of debris and excess fill material and/or mud, shall be covered by the terms and conditions of this Agreement, to the fullest extent provided by law and by prevailing wage determinations of the California Department of Industrial Relations. Employers, including brokers, of persons providing construction trucking work shall provide certified payroll records to the City within ten (10) calendar days of written request or as required by bid specifications.

### 24 Exclusions: The following shall be excluded from the scope of this Agreement:

2.4.1 This Agreement is not intended to, and shall not affect or govern the award of public works contracts by the City which are outside the identified scope of work of the Projects.

2.4.2 This Agreement is not intended to, and shall not affect the current or anticipated operation, maintenance, access or use of any of the City's buildings or facilities, whether or not such facilities are identified in Section 1.7 above.

2.4.3 This Agreement shall not apply to a Contractor or subcontractor's executives, managerial employees, engineering employees, design employees, supervisors (except

those covered by existing building and construction trades collective bargaining agreements), office and clerical employees.

2.4.4 This Agreement shall not apply to any work performed on or near or leading to the site of work covered by this Agreement that is undertaken by state, county or other governmental bodies or their contractors; or by public or private utilities or their contractors; or by the City or its contractors for work not part of the scope of the Projects. Parties performing work shall notify in writing, The Council and The District of any work being performed near or leading to the site work that is not covered by this agreement. Further, this Agreement shall not be construed to prohibit or restrict the City or its employees from performing work on or around the Project construction sites or from entering the sites for any purposes deemed necessary or appropriate by the City.

2.4.5 This Agreement shall not apply to the off-site maintenance of leased equipment or the on-site supervision of such work.

2.4.6 This Agreement shall not apply to any start-up, calibration, performance testing, repair, maintenance, operational revisions to systems and/or subsystems performed after Completion.

2.5 Termination, Suspension and/or Delay of Work: It is understood and agreed that the City, at its sole option, may change, terminate, delay and/or suspend any and all portions of the covered work at any time. Further, the City may prohibit some or all work on certain days or during certain hours of the day to comply with applicable codes, laws or regulations, permits or to accommodate the ongoing operations of the City's facilities and/or to mitigate the effect of the ongoing Projects' work on the businesses and residents in the neighborhood of the Project sites; and/or require such other operational or schedule changes that it may be deemed necessary, in its sole judgment, to effectively maintain the primary purpose of the City's facilities and to remain a good neighbor to the residents and businesses in the area of any Projects. In order to permit the Contractors and Unions to make appropriate scheduling plans, the City will provide the affected Contractor and Union(s) with reasonable notice of any changes it requires pursuant to this Section.

2.6 Work covered by this Agreement within the following craft jurisdictions shall be performed under the terms of their National Agreements as follows: the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, and the National Agreement of Elevator Constructors, and any instrument calibration work and loop checking shall be performed under the terms of the UA/IBEW Joint National Agreement for Instrument and Control Technicians, with the exception that Articles 4, 8, 12 and 13 of this Agreement shall apply to such work.

### **ARTICLE 3**

#### **EFFECT OF AGREEMENT/SUBCONTRACTORS**

3.1 By executing this Agreement, the Unions and the City agree to be bound by each and every provision of this Agreement.

3.2 By accepting the award of a Construction Contract for the Projects, whether as contractor or subcontractor at any tier, the Contractor/Subcontractor agrees to be bound by each and every provision of this Agreement.

3.3 This Agreement shall only be binding on the signatory parties hereto and shall not apply to the parents, affiliates, subsidiaries, or other ventures of any other party.

3.4 It is understood that this Agreement, together with the referenced MLA , constitute an integrated, self-contained, stand-alone agreement, and that by virtue of having become bound to this Agreement, the Contractor will not be obligated to sign any other local, area, or national agreement as a condition of performing work within the scope of this Agreement. In addition, it is understood and agreed that all grievances and disputes involving the interpretation or application of this Agreement, including the MLA, shall be resolved according to the procedures set forth in Article 12 of this Agreement; provided, however, that should a dispute involve a single MLA and a Contractor signatory thereto, and not involve interpretation or application of this Agreement, then such dispute shall be processed and resolved pursuant to the grievance provisions of that MLA. Should there be a dispute in the first instance as to whether the provisions of Article 12 of this Agreement or the grievance procedures of a MLA apply, the dispute shall be presented initially to arbitrator Judge William Cahill or, if unavailable, arbitrator Earnest Brown, for resolution as to the applicable procedure. Such referral of a dispute as to the applicable procedures shall be done by an immediate conference call among the parties and the arbitrator, and heard and decided within three (3) calendar days. Should the arbitrator hold that Article 12 applies, the parties may, by mutual agreement, submit the issue to the same arbitrator pursuant to the provisions of Article 12, or, absent mutual agreement, commence processing the dispute at Step 1 of that Article.

3.5 Subcontractors. At the time that any Contractor enters into a subcontract with any subcontractor of any tier for the performance of construction or construction trucking work within the scope of this Agreement, the Contractor shall provide a copy of this Agreement, as it may from time to time be modified by the negotiating parties, to said subcontractor and shall require the subcontractor as a part of accepting an award of a construction subcontract to agree to be bound by each and every provision of the Agreement prior to the commencement of work.

3.5.1 Each Contractor and Subcontractor shall evidence their agreement to be bound to this Agreement by executing the Agreement To Be Bound form attached hereto as Appendix A. A copy of the Agreement To Be Bound executed by the Contractors and Subcontractors shall be submitted to the Union(s) prior to both the commencement of work and the Pre-Job Conference and will be a required submittal within the City's bid packages. If the Contractor or Subcontractor refuses to execute the Agreement To Be

Bound, then such Contractor or Subcontractor shall not be awarded a Construction Contract to perform work on the Projects. A Contractor or Subcontractor who executes the Agreement to Be Bound shall be considered a signatory party to this Agreement.

36 It is understood that the liability of each Contractor and Subcontractor and the liability of each Union under this Agreement shall be several and not joint. The Unions agree that this Agreement does not have the effect of creating any joint employment status between or among the City and/or any Contractor or Subcontractor.

37 With regard to any Contractor or subcontractor that is independently signed to any MLA, this Agreement shall in no way supersede or prevent the enforcement of any subcontracting clause contained in such MLA, except as specifically set forth in section 3.7.1 of this Agreement. Any such subcontracting clause in a MLA shall remain and be fully enforceable between each craft union and its signatory employers and no provision of this Agreement shall be interpreted and/or applied in any manner that would give this Agreement precedence over subcontracting obligations and restrictions that exist between craft Unions and their respective signatory employers under a MLA, except as specifically set forth in section 3.7.1 in this Agreement. To the extent that the provisions of this Agreement are inconsistent with any other provisions contained in a MLA, the provisions of this Agreement shall prevail

3.7.1 If a craft Union (“Aggrieved Union”) believes that an assignment of work on this Project has been made improperly by a Contractor or subcontractor, even if that assignment was as a result of another craft Union’s successful enforcement of the subcontracting clause in its MLA, as permitted by section 3.7 of this Agreement, the Aggrieved Union may submit a claim under the jurisdictional dispute resolution procedure contained in Article 13 of this Agreement and the decision rendered as part of that process shall be enforceable to require the Contractor or subcontractor that made the work assignment to assign that work prospectively to the Aggrieved Union. An award made to a craft Union under the subcontracting clause of its MLA, as permitted under section 3.7 of this Agreement, shall be valid and fully enforceable by that craft Union unless it conflicts with a jurisdictional award made pursuant to Article 12 of this Agreement. If the award made under MLA conflicts with the jurisdictional award, the award of any damages under the former shall be null and void *ab initio*.

**ARTICLE 4**  
**WORK STOPPAGES, STRIKES, SYMPATHY STRIKES, JURISDICTIONAL**  
**DISPUTES AND LOCKOUTS**

4.1 The Unions, City and Contractor agree that for the duration of the Projects:

4.1.1 There shall be no strikes, sympathy strikes, work stoppages, picketing, hand-billing or otherwise advising the public that a labor dispute exists, or slowdowns of any kind, for any reason, by the Unions or construction persons employed on the Projects, at a job site of the Projects or at any other facility of the City because of a dispute on the Projects. Nor shall the Unions or construction persons employed on the Projects participate in any strikes, sympathy strikes, work stoppages, picketing, hand billing,



slowdowns, or otherwise advising the public that a labor dispute exists at a Project jobsite because of a dispute between Unions and Contractor(s) on any other project.

4.1.2 As to construction persons employed on the Projects, there shall be no lockout of any kind by a Contractor covered by this Agreement. It shall not be a violation of this Article if a Contractor or Subcontractor (1) suspends or terminates a portion of the Project work or (2) discharges an employee for just cause.

4.1.3 If a MLA between a Contractor and the Union expires before the Contractor completes the performance of a Construction Contract and the Union or Contractor gives notice of demand for a new or modified MLA, the Union agrees that it will not strike, picket, hand-bill, slowdown or engage in any other disruptive activity against the Contractor and the Contractor will not lockout construction persons of the Union on said Construction Contract for work covered under this Agreement and the Union and the Contractor agree that the expired MLA shall continue in full force and effect for work covered under this Agreement until a new or modified MLA is reached between the Union and Contractor. If the new or modified MLA reached between the Union and Contractor provides that any terms of the new MLA shall be retroactive, the Contractor agrees to comply with any retroactive terms of the new or modified MLA which are applicable to construction persons employed on the Projects within seven (7) calendar days.

4.2 A party to this Agreement shall institute the following procedure, prior to invoking any other action at law or equity when a breach of this Article 4 is alleged to have occurred:

4.2.1 A party invoking this procedure shall notify, by the most expeditious means available, with notice by facsimile, electronic mail or telephone to the City, to the party alleged to be in violation, to the Council and to the involved local Union if a Union is alleged to be in violation.

4.2.2 Upon receipt of said notice, the City will contact the designated permanent arbitrator, Judge William Cahill, or if unavailable, his alternate Ernest Brown, who shall attempt to convene a hearing within twenty-four (24) hours if it is contended that the violation still exists.

4.2.3 The Arbitrator shall notify the parties by facsimile, electronic mail or telephone of the place and time for the hearing. Said hearing shall be completed in one session, which, with appropriate recesses at the arbitrator's discretion, shall not exceed twenty-four (24) hours unless otherwise agreed upon by all parties. A failure of any party to attend said hearings shall not delay the hearing of evidence or the issuance of any award by the arbitrator.

4.2.4 The sole issue at the hearing shall be whether or not a violation of Article 4, Section 4.1 of this Agreement has occurred. The arbitrator shall have no authority to consider any matter of justification, explanation or mitigation of such violation or to

award damages, which issue is reserved for court proceedings, if any. The award shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without a written opinion. If any party desires a written opinion, one shall be issued within fifteen (15) calendar days, but its issuance shall not delay compliance with or enforcement of the award. The arbitrator may order cessation of the violation of this Article 4 and other appropriate relief and such award shall be served on all parties by hand or registered mail upon issuance.

4.2.5 Such award may be enforced by any Court of competent jurisdiction upon the filing of this Agreement and all other relevant documents referred to above in the following manner. Written notice of the filing of such enforcement proceedings shall be given to the other party. In the proceeding to obtain a temporary order enforcing the arbitrator's award as issued under Section 4.2.4 of this Article 4, all parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any party's right to participate in a hearing for a final order or enforcement. The Court's order or orders enforcing the arbitrator's award shall be served on all parties by hand or delivered by certified mail.

4.2.6 Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance are waived by the parties.

4.2.7 The fees and expenses of the arbitrator shall be divided equally between the party instituting the arbitration proceedings provided in this Article and the party alleged to be in breach of its obligations under this article.

4.3 Liquidated Damages. If the arbitrator determines that a violation of Section 4.1 has occurred, the breaching party shall, within eight (8) hours of the issuance of the decision take all steps necessary to immediately cease such activities and return to work. If the breaching party involved does not cease such activities by the beginning of the next regularly scheduled shift following the expiration of the eight (8) hour period after the arbitrator's issuance of the decision, then the breaching party shall pay the sum of ten thousand dollars (\$10,000) as liquidated damages to the City per shift until the breach is remedied. The arbitrator shall retain jurisdiction for the sole purpose of determining compliance with this obligation and determining the amount of liquidated damages, if any; but such retention shall not prevent the moving party from seeking judicial enforcement of the initial decision.

## **ARTICLE 5**

### **PRE-JOB CONFERENCE**

5.1 A mandatory pre-job conference shall be held prior to the commencement of each Construction Contract. Such conference shall be attended by a representative each from the participating Contractor(s) and Union(s) and the Project Manager. All efforts will be made to hold the pre-job conference in sufficient time to ensure all parties the ability to properly raise and resolve any issue that may arise out of such meeting, with a

goal that such conferences will be held at least 21 work days before the work commences.

**ARTICLE 6**  
**NO DISCRIMINATION**

6.1 The Contractors and Unions agree not to engage in any form of discrimination on the ground of or because of race, color, creed, national origin, ancestry, age, religious or political affiliation, gender, sexual orientation or disability against any person, or applicant for employment on the Projects.

**ARTICLE 7**  
**UNION SECURITY**

7.1 The Contractors recognize the Union(s) as the sole bargaining representative of all construction persons working within the scope of this Agreement.

7.2 All construction persons who are employed by the Contractor(s) shall, as a condition of employment, on or before the eighth (8th) day of consecutive or cumulative employment on the Projects, be responsible for the payment of the applicable monthly working dues and any associated fees uniformly required for union membership in the applicable local union which is signatory to this Agreement. Further, there is nothing in this Agreement that would prevent non-union construction persons from joining the local union.

**ARTICLE 8**  
**REFERRAL AND LOCAL HIRE PROGRAM**

8.1 Referral

8.1.1 Contractor (s) performing construction work on the Projects described in the Agreement shall, in filling craft job requirements, utilize and be bound by the registration facilities and referral systems established or authorized by the Unions signatory hereto ("Job Referral System"). Such Job Referral System will be operated in a non-discriminatory manner and in full compliance with all federal, state, and local laws and regulations, including those which require equal employment opportunities and nondiscrimination.

8.1.2 The Contractor(s) shall have the right to reject any applicant referred by the Union(s), in accordance with the applicable Master Agreement.

8.1.3 The Contractor(s) shall have the unqualified right to select and hire directly all supervisors above general foreman it considers necessary and desirable, without such persons being referred by the Unions(s).

8.1.4 In the event that referral facilities maintained by the Union(s) are unable to fill the requisition of a Contractor(s) for employees within a seventy-two (72) hour period after

such requisition is made by the Contractor(s), the Contractor(s) shall be free to obtain employees from any source. Contractor(s) shall promptly notify the Union(s) of any applicants hired from other sources. This provision does NOT affect core employees as defined below.

8.15 Unions shall exert their utmost efforts to recruit sufficient numbers of skilled craft persons to fulfill the requirements of the Contractor(s).

#### 8.16 Core Employees

All parties agree to make a good faith effort to refer on a priority basis, consistent with the non-discriminatory referral procedures of the hall, qualified and available, and bona-fide Berkeley Residents for Project work.

8.17 The parties also recognize and support the City's commitment to provide opportunities for participation on the Projects to Berkeley Residents who are regular, experienced employees ("Core" employees) of contractors and subcontractors awarded work on the Projects and who do not traditionally work under a local collective bargaining agreement(s). In furtherance of this commitment, the parties agree that such contractors and subcontractors awarded work on the Projects may request by name, and the local will honor, referral of persons who have applied to the local union for Project work and who demonstrate the following qualifications:

- (1) Possess any license required by state or federal law for the Project work to be performed;
- (2) Have worked a total of at least one thousand (1,000) hours in the construction craft during the prior three (3) years;
- (3) Were on the Contractor's active payroll for at least sixty (60) out of the one hundred and eighty (180) calendar days prior to the contract award;
- (4) Have the ability to perform safely the basic functions of the applicable trade, and
- (5) Are Berkeley residents.

The Union will refer to such Contractor one journeyman employee from the hiring hall out-of-work list for the affected trade or craft, and will then refer one of such Contractor's "core" employees as a journeyman and shall repeat the process, one and one, until such Contractor's crew requirements are met or until such Contractor has hired five (5) "core" employees, whichever occurs first. Thereafter, all additional employees in the affected trade or craft shall be hired exclusively from the hiring hall out-of-work list(s). For the duration of the Contractor's work the ratio shall be maintained and when the Contractor's workforce is reduced, employees shall be reduced in the same ratio of core employees to hiring hall referrals as was applied in the initial hiring.

8.1.8 The Contractor shall notify the appropriate Union of the name and social security number of each direct hire and each direct hire shall register with the Union's hiring hall before commencing Project work. If there is any question regarding an employee's eligibility under this Subsection 8.2.1, the City Representative, at a Union's request, shall obtain satisfactory proof of such from the Contractor.

## 8.2 Local Hire

8.2.1 To the extent allowed by law and consistent with the non-discriminatory referral procedures of the Union hiring halls, the Parties agree to a goal that Berkeley Residents will perform a minimum of 20% of the hours worked, on a craft by craft basis for the Projects. The Contractor(s) shall make good faith efforts to reach this goal through the utilization of the Unions' hiring hall procedures. The Unions shall exercise their best efforts in their recruiting and training of Berkeley Resident workers and in their hiring hall procedures to facilitate this 20% goal on the Projects. In the event that referral facilities maintained by the Union(s) are unable to fulfill the 20% local hire requirement, paragraph 8.2.2 of this Article shall not apply. Contractors shall document all efforts to hire locally and provide such documents to the City of Berkeley. The Council will provide an annual census of Berkeley residents, in each of the crafts party to this agreement, to the City of Berkeley. This report will be provided by August 1 of each year of this agreement.

8.2.2 Should any of the contractors performing work on the Projects fail to meet this 20% goal and fail to demonstrate efforts to do so, through a specific submittal process to be included in their contractual requirements and enforced by the grievance procedure. The contract's 10% retention will be held until such time that this failure is remedied, but not longer than sixty (60) calendar days after the date of substantial completion of the Projects or as required by law, in addition to the breach of contract remedies available to the parties for non-performance under this Agreement.

## 8.2.3 Apprenticeship & Workforce Development

A) Consistent with the requirements of California Labor Code §§ 1776, 1777.5 and 1777.6, Contractor(s) will be required to hire 1 New Apprentice Berkeley resident as for every \$500,000 dollars or more of total construction bid amount. The New Apprentice(s) must work a minimum of 10% of the projects work hours. The contractor may deploy the apprentice to work on another concurrent project in order to meet the minimum hours, and those hours will be counted towards the total hours of the craft on the Berkeley project. Certified Payroll must reflect the hours worked.

Contractor must fully document efforts to hire a New Apprentice, through the following steps: 1) requesting New Apprentices through the Union dispatch procedure, 2) contacting a minimum of three MC3-approved pre-apprenticeship training programs for referral of Berkeley residents. Unions shall provide written documentation to the contractor in response to dispatch requests to fulfill the New Apprentice requirement, the next tier of residents will come from the Green Corridor.

B) There can be no more than 1 entry-level New Apprentices for each craft, provided said crafts have apprenticeship openings and the general contractor will be able to include New Apprentices hired by their subcontractor to meet this requirement. Unions will agree to cooperate with Contractor(s) in furnishing apprentices as requested and the hiring of the apprentices will be in accordance to the Apprenticeship provisions listed in the Master Agreements and or the union agreements with the division of apprenticeship standards, and the apprentices shall be properly supervised and paid in accordance with provisions contained within the MLA'S. The Unions and Contractors will agree to cooperate with local pre-apprenticeship programs to ensure Berkeley residents have the opportunity to apply for and enter the into the apprenticeship programs.

C) The intent of this provision is to utilize Berkeley Resident New Apprentices to the fullest extent permissible by state law and the MLA. Failure of Contractor(s) and their subcontractors to maintain qualified apprentices on the job will be subject to further penalties as determined by the Grievance Committee as identified in Article 12.

#### 8.11 Enforcement, Compliance & Reporting.

Contractors will be required to submit Certified Weekly Payrolls to the City along with monthly workforce utilization reports documenting the Contractor's compliance with the requirements described in this article. At a minimum the monthly reports must include 1) data on Berkeley Resident's work hour utilization on a craft by craft basis, 2) number of New Apprentices hired and the hours they have worked, 3) documentation showing any requests made to the union dispatchers for Berkeley Residents and the Union's response to the request. Enforcement of this article shall be according to the Grievance and Arbitration procedure outlined in Article 12.

### **ARTICLE 9** **HELMETS TO HARDHATS**

9.1 The parties recognize a desire to facilitate the entry into the Building and Construction Trade Union(s) of Veterans who are interested in careers in the building and construction industry. The parties agree to utilize the services of the Center for Military Recruitment, Assessment and Veteran's Employment ("Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the parties.

9.2 The Union(s) and Contractor(s) agree to coordinate with the Center to participate in an integrated database of Veterans interested in working on this Project and of apprenticeship and employment opportunities for this Project. To the extent permitted by law, the Union(s) will give credit to such Veterans for bona fide, provable past experience.

**ARTICLE 10**  
**GRIEVANCE PROCEDURE**

10.1 Any Contractor which is not otherwise bound through an agreement with a Union to a grievance procedure which confers jurisdiction to consider and resolve disputes over the imposition of discipline or dismissal of its construction persons working on this Project shall be bound to the arbitration procedure contained in the MLA of the craft representing the employee(s) involved in the dispute. For the purposes of this Article, such grievance procedure shall be limited to disputes regarding the imposition of discipline or dismissal arising from work covered by the Agreement. Such Contractor shall not impose discipline or dismissal on its construction persons covered by this Agreement without just cause.

**ARTICLE 11**  
**JOINT ADMINISTRATIVE COMMITTEE**

11.1 The parties to this Agreement shall establish a five (5) person Joint Administrative Committee comprised of at least one and up to two (2) representatives representing the City; two (2) representatives of the signatory Unions and The Council; and one industry representative, mutually selected by the City and The Council. Each representative shall designate an alternate who shall serve in his or her absence for any purpose contemplated by this Agreement.

11.2 The Joint Administrative Committee shall meet at the request of either party, but not less than once each quarter, to review the implementation of the Agreement and the progress of the Projects including, but not limited to, compliance with Article 8, prevailing wage, safety, Workforce development and Industry trends. Requests for certified payroll made by a Joint Labor/Management Committee to which the Union(s) signatory to this Agreement are a party shall be provided as allowed by law.

**ARTICLE 12**  
**GRIEVANCE ARBITRATION PROCEDURE**

12.1 The parties understand and agree that in the event any dispute arises out of the meaning, interpretation or application of the provisions of this Agreement, the same shall be settled by means of the procedures set out herein. No grievance shall be recognized unless the grieving party provides notice in writing to the signatory party with whom it has a dispute within seven (7) calendar days after becoming aware of the dispute, but in no event more than thirty (30) calendar days after it reasonably should have become aware of the event giving to the dispute. The time limits in this Article 12 may be extended by mutual written agreement of the parties.

12.2 Grievances shall be settled according to the following procedures:

**Step 1:** Within seven (7) calendar days after the receipt of the written notice of grievance, the Business Representative of the involved Local Union, the City's authorized representative, representative of the construction person, and the representative of the involved Contractor shall confer and attempt to resolve the grievance.

**Step 2:** In the event that the representatives are unable to resolve the dispute within seven (7) calendar days after its referral to Step 1, either involved party may submit it within three (3) calendar days to Grievance Committee. The Grievance Committee shall consist of one (1) person selected by the City and one (1) person selected by the Council, which shall meet within seven (7) calendar days after such referral (or such longer time as mutually agreed upon by all representatives of the subcommittee), to confer in an attempt to resolve the grievance. The decision of the Grievance Committee shall be legal, final and binding. If the dispute is not resolved within such time seven (7) calendar days after its referral or such longer time as mutually agreed upon) it may be referred within seven (7) calendar days by either party to Step 3.

**Step 3:** Within seven (7) seven calendar days after referral of a dispute to Step 3, the representatives shall submit the matter to the designated permanent Arbitrator, Judge William Cahill.

12.3 In the event that Judge Cahill is unavailable, the arbitrator shall be Earnest Brown.

12.4 The Arbitrator shall arrange for a hearing no later than fourteen days (14) calendar days after the matter has been submitted to arbitration. A decision shall be given to the parties within five (5) calendar days after completion of the hearing unless such time is extended by mutual agreement. A written opinion may be requested by a party from the Arbitrator. The time limits specified in any step of the Grievance Procedure set forth in Section 12.1 may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without the request for an extension of time, shall be deemed a waiver of such grievance without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

12.5 The decision of the Arbitrator shall be binding by all parties. The Arbitrator shall not have authority to change, amend, add, or detract from any of the provisions of the Agreement. The expense of the Arbitrator shall be borne equally by both parties.



12.6 In order to encourage the resolution of disputes and grievances at Step 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

### **ARTICLE 13** **JURISDICTIONAL DISPUTES**

131 The assignment of Covered Work will be solely the responsibility of the Contractor/Employer(s) performing the work involved; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") or any successor Plan.

132 All jurisdictional disputes on this Project between or among the Union(s) and the Contractor/Employer(s), parties to this Agreement, shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department, or any other plan or method of procedure that may be adopted in the future by the Building and Construction Trades Department. Decisions rendered shall be final, binding and conclusive on the Contractor/Employer(s) and Union(s) parties to this Agreement.

13.2.1 If a dispute arising under this Article involves the Northern California Carpenters Regional Council or any of its subordinate bodies, an Arbitrator shall be chosen by the procedures specified in Article V, Section 5, of the Plan from a list composed of John Kagel, Thomas Angelo, Robert Hirsch and Thomas Pagan and the Arbitrator's hearing on the dispute shall be held at the offices of the California State Building and Construction Trades Council in Sacramento, California, within fourteen (14) calendar days of the selection of the Arbitrator. All other procedures shall be as specified in the Plan.

133 All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, or slow-down of any nature, and the Contractor/Employer(s)' assignment shall be adhered to until the dispute is resolved. Individuals violating this Section shall be subject to immediate discharge.

134 Each Contractor/Employer(s) shall conduct a Pre-Job Conference with the Council prior to commencing Covered Work. The Primary Employer, Coordinator and the District will be advised in advance of all such conferences and may participate if they wish. Pre-job conferences for different Contractor(s) may be held together.

### **ARTICLE 14** **APPRENTICES**

14.1 Recognizing the need to maintain continuing support of programs designed to develop adequate numbers of competent workers in the construction industry, the Contractor (s) shall employ apprentices in the respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured.

14.2 The apprentice ratios will be in compliance with the applicable provisions of the California Labor Code and Prevailing Wage Rate Determination.

14.3 There shall be no restrictions on the utilization of apprentices in performing the work of their craft provided they are properly supervised.

14.4 All Apprentices will come from a State approved Labor Management Apprenticeship program.

## **ARTICLE 15** **MANAGEMENT RIGHTS**

15.1 The Contractor shall retain full and exclusive authority for the management of their operations, including the right to direct their work force in their sole discretion with regard to the following: the hiring, promotion, transfer, layoff, corrective action or discharge for just cause of its employees (in accordance with Article 9); the determination of the number of employees needed for the Project work; the selection/hiring of foremen and supervisors; the assignment and schedule of work; the requirement of overtime work, the determination of when it will be worked, and the number of employees engaged in such work, except as otherwise limited by the terms of this Agreement and/or the MLA. No rules, customs or practices shall be permitted or observed which limit or restrict production, or limit or restrict the working efforts of construction persons except that the lawful manning provisions of the MLA shall be recognized.

## **ARTICLE 16** **WAGES/BENEFITS**

16.1 **Wages.** All construction persons covered by this Agreement shall be classified in accordance with work performed and paid the hourly wage rates for those classifications in the applicable MLA for such craft work and in compliance with the applicable prevailing wage rate determination.

16.2 **Benefits.** Contractor agrees to pay contributions into established construction person benefit funds in the amounts designated in the appropriate MLA; provided, however, that each Contractor and Union agree that only such bona fide construction person benefits as included in the prevailing wage determination shall be included in this requirement and required to be paid by the Contractor under this Agreement; provided further, however, that this provision does not relieve Contractors signatory to a local collective bargaining agreement with a signatory Union which would be applicable to the Projects from making

any other fund contributions (including, but not limited to, those for contract administration), required by such local agreement. Contractor shall not be required to pay contributions to any other trust funds to satisfy their obligation under this Article. By signing this Agreement, the Contractors adopt and agree to be bound by the written terms of the legally established Trust Agreements, specifying the detailed basis on which the payments are to be made into, and the benefits paid out of, such Trust Funds.

**16.3 Compliance.** It shall be the responsibility of the Contractor(s) and Unions to investigate and monitor compliance with the provisions of the agreement contained in Article 15. Nothing in this agreement shall be construed to interfere with or supersede the usual and customary legal remedies available to the Unions and/or employee benefit Trust Funds to collect delinquent Trust Fund contributions from Contractors on the Project.

## **ARTICLE 17**

### **MODIFIED MASTER LABOR AGREEMENTS**

17.1 Certain Provisions Shall Not Apply. Provisions negotiated into the new or modified MLA which are less favorable to the Contractor than those uniformly required of employers for construction work normally covered by those agreements or which may be construed to apply exclusively or predominately to work covered by this Agreement shall not apply to work covered by this Agreement. Any disagreement between the parties regarding the application of the provisions of any new or modified collective bargaining agreement to work covered by this Agreement shall be resolved under the dispute and grievance arbitration procedures set forth in Article 12 hereof.

## **ARTICLE 18**

### **DRUG and ALCOHOL TESTING**

18.1 The use, sale, transfer, purchase and/or possession of a controlled substance, alcohol and/or firearms at any time during the work day is prohibited.

18.2 Employer shall be allowed to utilize employment drug screens. All personnel are subject to random alcohol and drug/alcohol testing at any time, except, the following changes will apply. Employer shall follow said Unions Master Labor Agreement drug polices, regulations and limits. Body fluid tests will utilize urine and saliva specimens. Employer may also selectively require an employee to undergo alcohol or drug/alcohol testing if Employer has reasonable cause to believe that an employee's ability to work safely may be impaired. All requirements and activities of the Employer with regard to drug/alcohol testing shall comply with the provisions of State law.

**ARTICLE 19**  
**SAVINGS CLAUSE**

19.1 The parties agree that in the event any article, provision, clause, sentence or word of this Agreement is determined to be illegal or void as being in contravention of any applicable law, by a court of competent jurisdiction the remainder of the Agreement shall remain in full force and effect. The parties further agree that if any article, provision, clause, sentence or word of the Agreement is determined to be illegal or void, by the court of competent jurisdiction, the parties shall substitute, by mutual agreement, in its place and stead, an article, provision, clause, sentence or word which will meet the objections to its validity and which will be in accordance with the intent and purpose of the article, provision, clause, sentence or word in question.

19.2 The parties also agree that in the event that a decision of a court of competent jurisdiction materially alters the terms of this Agreement such that the intent of the parties is defeated, then the entire Agreement shall be null and void.

**ARTICLE 20**  
**ENTIRE AGREEMENT**

20.1 This Agreement represents the complete understanding of the parties. The provisions of this Agreement, including the MLA, shall apply to the work covered by this Agreement. Where a subject covered by the provisions of this Agreement is also covered by a MLA, the provisions of this Agreement shall prevail. Where a subject is covered by the provisions of a MLA and is not covered by this Agreement, the provisions of the MLA shall prevail. Nothing contained in a MLA, working rule, by-laws, constitution or other similar document of the Unions shall in any way affect, modify or add to this Agreement unless otherwise specifically set forth in this Agreement or mutually agreed to in writing executed by the parties.

20.2 The parties agree that this Agreement covers all matters affecting wages, hours, and other terms and conditions of employment and that during the term of this Agreement the parties will not be required to negotiate on any further matters affecting these or any other subject not specifically set forth in this Agreement except by mutual agreement of the parties.

20.3 This Agreement may be executed in counterparts, such that original signatures may appear on separate pages and when bound together all necessary signatures shall constitute an original. Facsimile signature pages transmitted to other parties to this Agreement shall be deemed the equivalent to original signatures.

**ARTICLE 21**  
**TERM**

21.1 The Agreement shall be included as a condition of the award of the Construction Contracts.

21.2 The Agreement shall continue in full force and effect for a term of three years from the Effective Date of June 30, 2020 through June 30, 2023 and shall be applicable to all Projects until completion that are advertised for bidding during the term.

21.3 This Agreement shall continue in full force and effect until Completion of the Project. The parties may mutually agree to extend and/or amend this Agreement.

## SIGNATURES

### City of Berkeley

By: Dee Williams-Ridley

**Dee Williams-Ridley, City of Berkeley City Manager**

Date: 2/10/21

### Alameda County Building & Construction Trades Council, AFL-CIO

DocuSigned by:  
Andreas Cluver  
By: 5C9F6AE6571848E

**Andreas Cluver, Secretary-Treasurer for the Building Trades Council of Alameda County on behalf of the Signatory Unions**

Date: 1/26/2021

### Signatory Unions

**Asbestos Workers, Local 16 Boilermakers, Local 549**

**Bricklayers & Allied Craftsmen**

**Local 3 Cement Masons, Local 300**

**Electrical Workers, Local 595**

**Elevator Constructors, Local 8**

**Hod Carriers, Local 166**

**Iron Workers, Local 378**

**Laborers, Local 67**

**Laborers, Local 304**

**Operating Engineers,**

**Local 3 Plasterers, Local 66**

**Roofers, Local 81**

**Sheet Metal Workers, Local 104**

**Sign Display, Local 510**

**Sprinkler Fitters, Local 483**

**Teamsters, Local 853**

**United Association of Journeymen and Apprentices Fitting Industry,  
Underground Utility & Landscape, Local 355**

**United Association of Steamfitters, Ironworkers City and the RDA Council  
of Pipefitters, Plumbers, & Gas California Fitters, Local 342**

**Council No. 16 Northern California**

**International Union of Laborers**

**Painters & Allied Trades** (On behalf  
of Painters, Local 3; Carpet & Linoleum  
Layers, Local 12; Glass Workers, Local  
169; Auto & Marine Painters, Local 1176)

**Northern California Carpenters**

**Regional Council** (on behalf of Carpenters,  
Local 713; Carpenters, Local 2236; Lathers,  
Local 68L; Millwrights, Local 102; Pile  
Drivers, Local 34)

### AGREEMENT TO BE BOUND

The undersigned, as a Contractor or Subcontractor ("Contractor") on a City Project ("Project"), for and in consideration of the award to it of a contract to perform work on said Project, and in further consideration of the mutual promises made in the Project's Community Workforce Agreement ("Agreement"), a copy of which was received and is acknowledged, hereby:

1. Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all amendments and supplements now existing or which are later made to said Agreement.
2. Certifies that it has no commitments or agreements which would preclude its full and complete compliance with the terms and conditions of said Agreement;
3. Agrees to secure from any Contractor (as defined in said Agreement) which is or becomes a subcontractor (of any tier) to it, and from any successors, a duly executed Agreement to be bound in form identical to this document.
4. Contractor agrees that it shall be bound by all applicable trust agreements and plans for the provision of such fringe benefits as accrue to the direct benefit of the construction persons, including Health and Welfare, Pension, Training, Vacation, and/or other direct benefits provided pursuant to the appropriate craft agreement contained in Schedule "A" of Agreement.

Date: \_\_\_\_\_

Company Name: \_\_\_\_\_

Name of Prime Contractor or Higher Level Subcontractor:  
\_\_\_\_\_

Name of Project: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Contractor's License #: \_\_\_\_\_

Motor Carrier Permit (CA) #: \_\_\_\_\_