

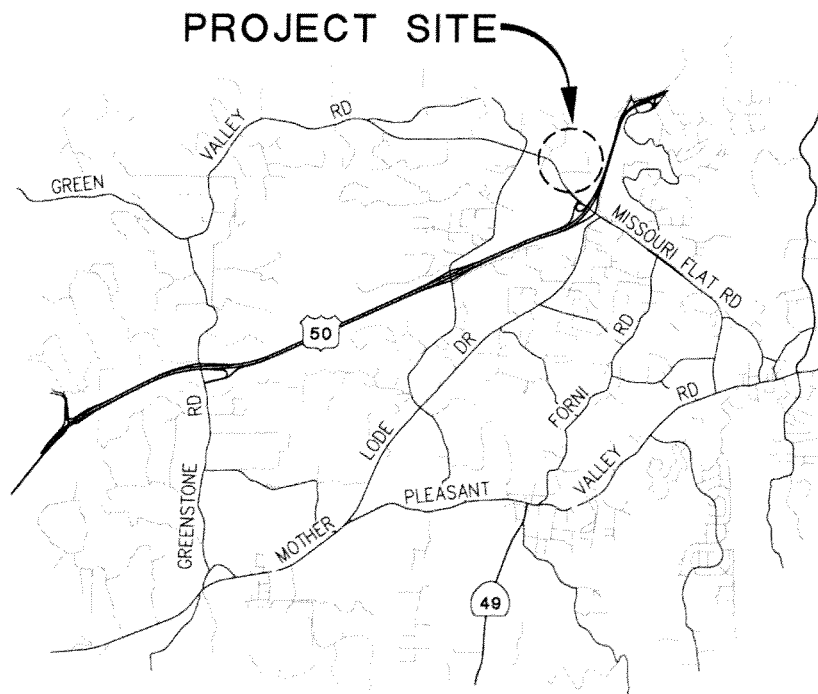
**COUNTY OF EL DORADO, CALIFORNIA  
DEPARTMENT OF TRANSPORTATION**

**CONTRACT DOCUMENTS**

**INCLUDING  
NOTICE TO BIDDERS, PROPOSAL, CONTRACT, CONDITIONS OF THE  
CONTRACT, AND TECHNICAL SPECIFICATIONS  
FOR**

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY**

**CONTRACT NO. PW 12-30631, CIP NO. 81134**



**BID OPENING DATE: December 3, 2012**


**COUNTY OF EL DORADO, CALIFORNIA  
DEPARTMENT OF TRANSPORTATION**

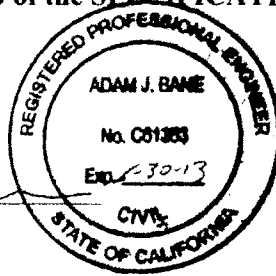
**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY**

**CONTRACT NO. PW 12-30631, CIP NO. 81134**

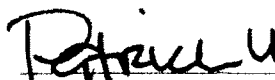
The various portions of the Contract Documents have been prepared under the direction of the following licensed Civil Engineer(s) and Architect, in accordance with California Business and Professions Code § 6735.

**CIVIL IMPROVEMENTS and DIVISION 0 of the SPECIFICATIONS:**

  
Adam Bane  
Registered Civil Engineer



**ARCHITECTURAL IMPROVEMENTS and DIVISION 1 thru 33 of the SPECIFICATIONS:**

  
Patrick M. Derickson  
Registered Architect



DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS

Notice to Bidders..... N-1  
 Instructions to Bidders.....I-1  
 Proposal.....P-1  
 Bidders Bond.....No Page Number  
 Draft Agreement..... C-1  
 Performance Bond.....No Page Number  
 Payment Bond.....No Page Number  
 Conditions of the Contract.....CC-1  
 Withholding Exemption Certification 590.....No Page Number  
 County Payee Data Record Form.....No Page Number  
 Certificate of Insurance.....No Page Number  
 Contractor’s Guarantee.....No Page Number

**TECHNICAL SPECIFICATIONS**

DIVISION 1 - GENERAL REQUIREMENTS

01 11 01 Summary of Work  
 01 23 00 Alternates  
 01 26 14 Requests for Information  
 01 32 15 Progress Schedule  
 01 33 01 Submittals  
 01 41 00 Regulatory Requirements  
 01 45 29 Testing Laboratory Services  
 01 50 00 Temporary Facilities and Controls  
 01 62 00 Product Options  
 01 65 50 Delivery, Storage and Handling  
 01 73 29 Cutting and Patching  
 01 77 00 Contract Closeout  
 01 78 40 Record Drawings

DIVISION 3 - CONCRETE

03 10 00 Concrete Formwork  
 03 21 00 Reinforcing Steel  
 03 30 00 Cast-in-Place Concrete

DIVISION 4 - MASONRY

04 05 00 Mortar and Grout  
 04 22 00 Concrete Unit Masonry

DIVISION 5 - METALS

05 12 00 Structural Steel  
 05 50 00 Metal Fabrications  
 05 51 00 Metal Stairs

DIVISIONS 6 - 12  
Not Used

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 90 10      Joint Sealing

DIVISION 8

-Not Used

DIVISION 9 - FINISHES

09 91 10      Painting

DIVISION 10 - SPECIALTIES

10 14 00      Signage  
10 41 16      Emergency Key Cabinets

DIVISION 11

11 14 00      Vehicle Service Equipment

DIVISION 12

-Not Used

DIVISION 13 - SPECIAL CONSTRUCTION

13 34 19      Prefabricated Metal Building

DIVISION 14 – 21

Not Used

DIVISION 22 – PLUMBING

22 05 00      Basic Materials & Methods – Plumbing  
22 05 01      Plumbing  
22 21 13      Plumbing Piping and Specialties

DIVISION 23 – MECHANICAL

23 05 00      Basic Materials & Methods – Mechanical  
23 07 00      HVAC Insulation  
23 31 13      Air Distribution  
23 82 39      Heat Transfer

DIVISION 26 – ELECTRICAL

26 05 00	Basic Electrical Materials and Methods
26 05 26	Grounding and Bonding
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes
26 05 36	Conductors and Cables
26 05 53	Electrical Identification
26 24 16	Panelboards
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 16	Enclosed Switches and Circuit Breakers
26 51 00	Interior Lighting
26 56 00	Exterior Lighting

DIVISION 27

-Not Used

DIVISION 28 – ELECTRONIC SAFETY & SECURITY

28 31 11	Digital, Addressable Fire Alarm System
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DIVISION 29 -30

Not Used

DIVISION 31 - EARTHWORK

31 00 00	Earthwork
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DIVISION 32 – EXTERIOR IMPROVEMENTS

32 00 00	Exterior Improvements
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DIVISION 33 - UTILITIES

33 10 00	Utilities
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\* End Section 00003 \*

**DEPARTMENT OF TRANSPORTATION  
COUNTY OF EL DORADO, CALIFORNIA**

**NOTICE TO BIDDERS**

**NOTICE IS HEREBY GIVEN** by the County of El Dorado, State of California, that sealed bids for work in accordance with the Project Plans (Plans) and Contract Documents designated:

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY  
CONTRACT NO. PW 12-30631, CIP NO. 81134**

will be received by the Clerk to the Board of Supervisors, at the Board of Supervisors Office, 330 Fair Lane, Placerville, California, until **Monday, December 3, 2012 at 2:00 PM**, at which time bids will be publicly opened and read by the El Dorado County Department of Transportation.

No Bid may be withdrawn after the time established for receiving bids or before the award and execution of the Contract, unless the award is delayed for a period exceeding sixty (60) calendar days. Bids shall be executed in accordance with the instructions given and forms provided in the bound Contract Documents furnished by the El Dorado County Department of Transportation. The Proposal shall not be detached and shall be submitted with the Contract Documents bid package in its entirety. All bids must be clearly marked on the envelope:

**"PROPOSAL FOR THE EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY"  
CONTRACT NO. PW 12-30631, CIP NO. 81134  
TO BE OPENED AT 2:00 P.M. -- Monday, December 3, 2012**

**LOCATION/DESCRIPTION OF THE WORK:** The project is located at the DOT Construction Office, 2441 Headington Road, in Placerville in El Dorado County. The Work to be done is shown on the Plans, and generally consists of, but is not limited to:

- A. The Work will be bid as a LUMP SUM BASE BID, LUMP SUM BID ADDITIVE 1, LUMP SUM BID ADDITIVE 2 and LUMP SUM BID ADDITIVE 3.
- B. LUMP SUM BASE BID: **Total of LUMP SUM BID** for Construction of a vehicle wash facility, including a prefabricated building with metal siding and roofing with a steel structure, foundation, CMU splash walls, a 2-stage, 2-level wash bay, equipment room, sump pit and associated underground utility improvements **PLUS LUMP SUM BID** for Trench and Excavation Safety for Trenches and Excavations five feet deep and greater. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.
- C. LUMP SUM BID ADDITIVE 1: Construction and installation of the metal catwalks in the "heavy solids / cold wash area" as shown on the plans along grid lines 1.1 and 2, between Grids A to C, including stair sections at Grid A and four (4) bollards at stair sections. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.
- D. LUMP SUM BID ADDITIVE 2: Construction and installation of the metal catwalks in the "hot water pressure wash area" as shown on the plans along grid lines 1.1 and 2, between Grids C to E, including stair sections at Grid E and four (4) bollards at stair sections. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.

- E. LUMP SUM BID ADDITIVE 3: Provide and install washing equipment. Refer to Contract Drawings A2.0, M2.1. P2.1 and E2.1. Refer to Specification Section 11 14 00 Vehicle Service Equipment. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.
- F. Bids are required for the entire Work described herein.
- G. Owner reserves the right to award; LUMP SUM BASE BID, some or all LUMP SUM BID ADDITIVES with the LUMP SUM BASE BID, or reject all bids. Determination of the lowest responsive, responsible bidder will be made based on the available construction budget and the Lump Sum Base Bid and Additives listed in the order of priority below whose total does not exceed the construction budget disclosed at the bid opening:
  - 1) Lump Sum Bid Additive 3.
  - 2) Lump Sum Bid Additive 3 and Lump Sum Bid Additive 2.
  - 3) Lump Sum Bid Additive 3, Lump Sum Bid Additive 2, and Lump Sum Bid Additive 1.

The actual construction budget will not be disclosed until after the deadline to receive bids has past and before bids are opened.

- H. The contract time, regardless of which combination of BID ADDITIVES is awarded, shall be ONE HUNDRED TEN (110) WORKING DAYS.
- I. For bonding purposes the anticipated project cost is less than \$ 500,000.
- J. A Pre-Bid / Site Visit Meeting is scheduled for this project at **1:00 pm on Friday, November 16, 2012** at the El Dorado County Department of Transportation, 2441 Headington Road, Placerville, CA. The meeting will be held in the downstairs conference room. **Attendance at the pre-bid meeting is mandatory and only the bids of firms with representatives in attendance will be considered for evaluation and award.** In order to limit the disruption to the conduct of business, the meeting date listed will be the only opportunity for bidders to visit the site. The Bidder's representative will be required to sign an attendance sheet and provide the name of the firm being represented. The County will post on the Department of Transportation's website such Addenda as the County in its discretion considers necessary in response to questions arising and information presented at the Pre-Bid / Site Visit Meeting. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda issued as a result of the Pre-Bid / Site Visit Meeting shall constitute the sole and exclusive record and statement of the results of the Pre-Bid / Site Visit Meeting.

**OBTAINING OR INSPECTING CONTRACT DOCUMENTS:** The Contract Documents Book and Plans may be examined at the El Dorado County Department of Transportation or may be purchased in person or by mail from the Department of Transportation, 2850 Fairlane Court, Placerville, California, 95667. The purchase price of each set of Contract Documents Book and Plans is seventy dollars (\$70.00) and is not refundable. To receive Contract Documents Book and Plans by FedEx, send request and payment prior to shipping and include an additional thirty dollars (\$30.00), for a total of one hundred dollars (\$100.00), to include shipping and handling. **Only Contract Documents Books and Plans purchased from the Department of Transportation will be acceptable for bid submittal.**

Headington Road Maintenance Yard Improvements, Foundation Design Criteria Report, dated August 18, 2005 and Headington Road Maintenance Yard Improvements – Update, Foundation Design Criteria Update, dated December 7, 2011 by Youngdahl Consulting Group Inc. will be provided as supplemental project information in pdf format on the DOT website: <http://www.edcgov.us/Government//DOT/Bids.aspx>.

**CONTRACTORS LICENSE CLASSIFICATION:** Bidders shall be properly licensed to perform the Work pursuant to the Contractors' State License Law (Business and Professions Code Section 7000 et seq.) and shall possess a **CLASS B** license or equivalent combination of Classes required by the categories and type of Work included in the Contract Documents Book and Plans at the time of the bid opening, and shall maintain a valid license through completion and acceptance of the Work,

including the guarantee and acceptance period. Failure of the successful Bidder to obtain proper adequate licensing shall constitute a failure to execute the Contract and shall result in the forfeiture of the Bidder's security.

**BUSINESS LICENSE:** The County Business License Ordinance provides that it is unlawful for any person to furnish supplies or services, or transact any kind of business in the unincorporated territory of El Dorado County without possessing a County business license unless exempt under County Ordinance Code Section 5.08.070. The Bidder to whom an award is made shall comply with all of the requirements of the County Business License Ordinance, where applicable, prior to beginning work under this Contract and at all times during the term of this Contract.

**REQUIRED LISTING OF PROPOSED SUBCONTRACTORS:** Each Proposal shall have listed therein the name and address of each subcontractor, to whom the Bidder proposes to subcontract portions of the work in an amount in excess of 1/2 of one percent of its total bid in accordance with the Subletting and Subcontracting Fair Practices Act, commencing with Section 4100 of the Public Contract Code. The Bidder shall also describe in the Subcontractor Listing the work to be performed by each subcontractor listed. The work to be performed by the subcontractor shall be shown by listing the description of the work, and portion of the work to be performed by the subcontractor in the form of a percentage calculated by dividing the work to be performed by the subcontractor by the lump sum base bid price. At the time the bids are submitted all listed subcontractors shall be properly licensed to perform their designated portion of the work. The Bidder's attention is invited to other provisions of the Act related to the imposition of penalties for a failure to observe its provisions by using unauthorized subcontractors or by making unauthorized substitutions.

**NONDISCRIMINATION:** Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

**NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM  
(GOVERNMENT CODE SECTION 12990)**

**PREVAILING WAGE REQUIREMENTS:**

In accordance with the provisions of California Labor Code Sections 1770 et seq., the general prevailing rate of wages in the county in which the Work is to be done has been determined by the Director of the California Department of Industrial Relations. These wage rates appear in the California Department of Transportation publication entitled General Prevailing Wage Rates. Interested parties can obtain the current wage information by submitting their requests to the Department of Industrial Relations, Division of Labor Statistics and Research, PO Box 420603, San Francisco CA 94142-0603, Telephone (415) 703-4708 or by referring to the website at <http://www.dir.ca.gov/dlsr/PWD>. The rates at the time of the bid advertisement date of a project will remain in effect for the life of the project in accordance with the California Code of Regulations, as modified and effective January 27, 1997.

Copies of the general prevailing rate of wages in the county in which the Work is to be done are also on file at the Department of Transportation's principal office, and are available upon request.

In accordance with the provisions of Labor Code 1810, eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and Contractor and any subcontractor employed under this Contract shall conform to and be bound by the provisions of Labor Code Sections 1810 through 1815.

**BID SECURITY:** A bid security shall be provided with each bid. Bid security shall be in an amount of not less than ten percent (10%) of the total amount of the Lump Sum Base Bid and shall be cash, a certified check, or cashier's check drawn to the order of the County of El Dorado or a Bidder's Bond executed by a surety satisfactory to the County of El Dorado and shall be **on the form provided in the Proposal section of these Contract Documents (do not detach the form)**.

**BID PROTEST PROCEDURE:** The protest procedure is intended to handle and resolve disputes related to the bid award for this project pursuant to County of El Dorado policies and procedures.

The protest procedure is an extension of the formal bid process and allows those who wish to protest the recommendation of an award after bid the opportunity to be heard.



**Policy:** Upon completion of the bid evaluation, the Department of Transportation shall notify all bidders of the recommendation of award, the basis therefore, and the date and time on which the recommendation for award will be considered and acted upon by the Board of Supervisors. All bidders may attend the Board of Supervisors meeting at the time the agenda item is considered, address the Board of Supervisors, and be heard.

**Procedure:** If a bidder wishes to protest the award, the procedure shall be as follows:

1. The Department of Transportation will review the bids received in a timely fashion under the terms and conditions of the Notice to Bidders, and notify the bidders in writing, at the address designated in the bid, of its recommendation including for award or rejection of bids (“All Bidders Letter”).
2. Within five (5) working days from the date of the “All Bidders Letter,” the bidder protesting the recommendation for award shall submit a letter of protest to and shall be received by the County of El Dorado, Department of Transportation, Attention Janel Gifford, 2850 Fairlane Ct, Placerville, CA 95667, and state in detail the basis and reasons for the protest. The bidder must provide facts to support the protest, including any evidence it wishes to be considered, together with the law, rule, regulation, or criteria on which the protest is based.
3. If the Department of Transportation finds the protest to be valid, it may modify its award recommendations and notify all bidders of that decision. If the Department of Transportation does not agree with the protest, or otherwise fails to resolve the protest, the Department of Transportation will notify the bid protestor and all interested parties of its decision and the date and time that the recommendation for award will be agendized for the Board of Supervisors’ consideration and action. The Department of Transportation shall also include in its report to the Board of Supervisors the details of the bid protest.
4. The bidder may attend the Board of Supervisors meeting at which the recommendation and bid protest will be considered. The Board of Supervisors will take comment from the bidder, staff, and members of the public who wish to speak on the item. In the event that the bidder is not in attendance at that time, the bid protest may be dismissed by the Board of Supervisors without further consideration of the merits; and  
The decision of the Board of Supervisors on the bid protest shall be final

**AWARD OF CONTRACT:** Bids will be considered for award by the Board of Supervisors. The County of El Dorado reserves the right after opening bids to reject any or all bids, to waive any irregularity in a bid, or to make award to the lowest responsive, responsible Bidder and reject all other bids, as it may best serve the interests of the County.

As a condition of award, the successful Bidder will be required to submit bonds and evidence of insurance prior to execution of the Agreement by the County. Failure to meet this requirement shall constitute abandonment of the Bid by the Bidder and forfeiture of the Bidder’s security. Award will then be made to the next lowest responsible Bidder.

**PAYMENTS:** Attention is directed to section 6.2 APPLICATIONS FOR PAYMENT of the Conditions of the Contract.

**RETAINAGE FROM PAYMENTS:** The Contractor may elect to receive one hundred percent (100%) of payments due under the Contract from time to time, without retention of any portion of the payment by the County, by depositing securities of equivalent value with the County in accordance with the provisions of Section 22300 of the Public Contract Code. Securities eligible for deposit hereunder shall be limited to those listed in Section 16430 of the Government Code, or bank or savings and loan certificates of deposit.

**PROJECT ADMINISTRATION:** All communications relative to the Contract Documents and Plans shall be directed to Janel Gifford in the El Dorado County Department of Transportation, 2850 Fairlane Ct, Placerville, CA 95762, telephone: (530) 621-5974, Janel.Gifford@edcgov.us No oral responses to any questions concerning the content of the Plans and Contract Documents will be given. All responses will be in the form of written addenda to the Contract Documents and Plans or written responses to bidders’ inquiries. Responses to bidders’ inquiries and addenda will be posted on the Department of Transportation website at [www.edcgov.us/Government/DOT/Bids.aspx](http://www.edcgov.us/Government/DOT/Bids.aspx). It is the bidders’ responsibility to check this website for responses and addenda during the bid period.

**BY ORDER OF** the Interim Director of the Department of Transportation, County of El Dorado, State of California.

Authorized by the Board of Supervisors on October 30, 2012, at Placerville, California.

By \_\_\_\_\_  
Kimberly A. Kerr, Interim Director,  
Department of Transportation  
County of El Dorado

**THESE INSTRUCTIONS SUPPLEMENT THE NOTICE TO BIDDERS, PROPOSAL, DRAFT AGREEMENT, AND CONDITIONS OF THE CONTRACT**

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY  
CONTRACT NO. PW 12-30631, CIP No. 81134**

**INSTRUCTIONS TO BIDDERS**

1. The County of El Dorado will receive sealed bids from Bidders as stipulated in the Notice to Bidders.
2. Owner reserves the right to award; LUMP SUM BASE BID, some or all LUMP SUM BID ADDITIVES with the LUMP SUM BASE BID, or reject all bids. All Bidders are required to submit bids on all bid items. Determination of the lowest responsive, responsible bidder will be made based on the available construction budget and the Lump Sum Base Bid and Additives listed in the order of priority below whose total does not exceed the construction budget disclosed at the bid opening:
  - a. Lump Sum Bid Additive 3.
  - b. Lump Sum Bid Additive 3 and Lump Sum Bid Additive 2.
  - c. Lump Sum Bid Additive 3, Lump Sum Bid Additive 2, and Lump Sum Bid Additive 1.

The actual construction budget will not be disclosed until after the deadline to receive bids has past and before bids are opened.

3. Bidders must submit bids only on forms provided in the Contract Documents, and shall be accompanied by all documents and information required to be submitted by these Instructions to Bidders, the Notice to Bidders, and by law. Bids not submitted on the required forms shall be deemed nonresponsive and shall not be considered. The Proposal form is bound together with the Notice to Bidders, Instructions to Bidders, Agreement, and attendant documents. A Proposal shall be deemed "Non-Responsive" if the proposal is submitted without the entire Contract Document package attached.
4. Bidders must submit Non-Collusion Affidavit form with their bids. Bids submitted without the affidavit will be deemed nonresponsive and will not be considered.
5. Bidders must supply all information required by Contract Documents and specifications. Bids must be full and complete. The County reserves the right at its sole discretion to reject any bid as nonresponsive as a result of any error or omission in the bid.
6. Bidders may not modify Proposal or qualify their bids.
7. Submission of a bid signifies that the Bidder has done a careful examination of the Contract Documents and has a complete understanding of the nature, extent and location of Work to be performed. Bidder must complete the tasks listed below in subsections "a" and "b" as a condition to bidding, and submission of bid shall constitute the Bidder's express representation to the County that Bidder has fully completed the following:
  - a. Bidder has attended the mandatory pre-bid meeting and has examined thoroughly and understands 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 Bidder and safety precautions and programs incident thereto;

- b. Bidder has given the County representative during the bid period 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 by County is acceptable to Bidder.
8. Substitutions: If the Bidder lists a manufacturer in its Proposal that is a substitute (i.e. "or equal"), such listing shall be considered a substitution request by the Bidder. If the Bidder is the apparent low Bidder, the Bidder shall, within two (2) business days following the bid opening, submit data substantiating the request for the substitution with the "or equal" item. Failure to submit such substantiating data within two (2) business days following the bid opening may result in the County deeming the apparent low Bidder non-responsive.
9. The following documents are to be executed and submitted by the apparent low Bidder after bids have been opened and duly inspected, the Contract has been awarded by the Board of Supervisors, and the County transmits the Notice of Award package to the successful Bidder. Failure to properly and timely submit these documents entitles the County to determine that the Bidder has abandoned the contract.

Submit the following documents to Janel Gifford, Department of Transportation, 2850 Fairlane Ct, Placerville, CA 95667 by 5 o'clock p.m. of the TENTH calendar day, not including Saturdays, Sundays, and legal holidays following the date of the NOTICE OF AWARD OF CONTRACT letter. Execution of Contracts by the County depends upon approval of Insurance Certificates and Bonds, and associated contract documents.

- i. Contracts: The successful Bidder shall execute and submit the Agreements for the work associated with the Proposal Lump Sum Bid Price Schedule (See Draft Agreement PW 12-30631) Submit two (2) originals of Agreement, each bearing an original signature.
- ii. County of El Dorado Performance Bond: To be executed by successful Bidder and surety each with notary acknowledgement.
- iii. County of El Dorado Payment Bond: To be executed by successful Bidder and surety each with notary acknowledgement.
- iv. Insurance certificates required by Contract Conditions and Article 8.
- v. California Form 590 – Withholding Exemption and County Payee Data Record Form

**\*END OF DOCUMENT\***

COMPLETING BID IN PENCIL, ERASURES, OVERWRITES, AND USE OF CORRECTION FLUID OR TAPE ARE NOT ACCEPTABLE. BID PROPOSALS WITH PENCIL, ERASURES, OVERWRITES, OR USE OF CORRECTION FLUID OR TAPE WILL BE REJECTED. ALL CHANGES MUST BE LINED OUT AND CORRECTIONS INSERTED ADJACENT TO THE CHANGE AND INITIALED BY THE BIDDER'S AUTHORIZED REPRESENTATIVE

**PROPOSAL**

**(to be attached to and submitted with this bound Contract Document bid package)**

**TO: THE DEPARTMENT OF TRANSPORTATION,  
COUNTY OF EL DORADO,  
STATE OF CALIFORNIA**

for the construction of

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY**

**CONTRACT NO. PW 12-30631, CIP NO. 81134**

NAME OF BIDDER \_\_\_\_\_

BUSINESS MAILING ADDRESS \_\_\_\_\_

CITY, STATE, ZIP \_\_\_\_\_

BUSINESS STREET ADDRESS \_\_\_\_\_

*(Please include even if P.O. Box used)*

CITY, STATE, ZIP \_\_\_\_\_

TELEPHONE NO:      AREA CODE (      ) \_\_\_\_\_

FAX NO:              AREA CODE (      ) \_\_\_\_\_

The work for which this Proposal is submitted is for the construction in accordance with these Contract Documents (including the payment of not less than the State general prevailing wage rates set forth herein), the Project Plans described below, including any addenda thereto, the Contract annexed hereto, and also in accordance with the standard drawings from the Design and Improvement Standards Manual of the County of El Dorado, revised May 18, 1990 ; the Labor Surcharge and Equipment Rental Rates in effect on the date the work is accomplished, and in accordance with the General Prevailing Wage rates. The Project Plans and Contract Documents Book for the work to be done are entitled:

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION**  
**EQUIPMENT / VEHICLE WASH FACILITY**

**CONTRACT NO. PW 12-30631, CIP NO. 81134**

Bids are to be submitted for the entire work. The work includes BASE LUMP SUM BID and LUMP SUM BID ADDITIVES 1, 2 & 3. Failure to submit bids for the entire work will result in the bid being deemed non-responsive.

The Bidder shall set forth for each lump sum item a total for the item, all in clearly legible figures in the respective spaces provided for this purpose.

In case of discrepancy between the lump sum prices and the total bids below, the lump sum prices shall prevail.

If the item total for a lump sum item is unreadable or otherwise unclear, or is omitted, the bid may be deemed irregular unless the project being bid has only a single item and a clear, readable total bid is provided.

Symbols such as commas and dollar signs will be ignored and have no mathematical significance in establishing lump sums. Written lump sums will be interpreted according to the number of digits and, if applicable, decimal placement. Bids on lump sum items shall be item totals only; if any unit price for a lump sum item is included in a bid and it differs from the item total, the items total shall prevail.

The foregoing provisions for the resolution of specific irregularities cannot be so comprehensive as to cover every omission, inconsistency, error or other irregularity which may occur in a bid. Any situation not specifically provided for will be determined in the discretion of the County of El Dorado, and that discretion will be exercised in the manner deemed by the County of El Dorado to best protect the public interest in the prompt and economical completion of the work. The decision of the County of El Dorado respecting the amount of a bid, or the existence or treatment of any irregularity in a bid, shall be final.

If this Proposal is accepted and the undersigned Bidder shall fail to enter into the Contract and furnish the two bonds in the sums required by the State Contract Act, with surety satisfaction to the County of El Dorado in accordance with the Special Provisions within ten (10) days, not including Saturdays, Sundays, and legal holidays, of the date of the letter notice from the County of El Dorado that the Contract has been awarded, the County of El Dorado may, at its option, determine that the Bidder has abandoned the Contract, and thereupon this Proposal and the acceptance thereof shall be null and void and the forfeiture of such security accompanying this Proposal shall operate and the same shall be the property of the County of El Dorado.

**Attention!** The undersigned Bidder acknowledges that a bid security must be submitted in amount of not less than ten (10) percent of the Lump Sum Base Bid.

The undersigned, as Bidder, declares under penalty of perjury under the laws of the State of California that the only persons or parties interested in this Proposal, as principals, are those named herein; that this Proposal is made without collusion with any other person, firm, or corporation; that it has carefully examined the location of the proposed work, the annexed proposed form of Contract, and the Plans therein referred to; and that it proposes, and agrees if this Proposal is accepted, that it will contract with the County of El Dorado, in the form of the copy of the Draft Agreement annexed hereto, to provide all necessary machinery, tools, apparatus, and other means of construction, and to do all the work and furnish all the materials specified in the Contract, in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that it will take in full payment therefore the following item prices, to wit:

**PROPOSAL LUMP SUM BID PRICE SCHEDULE  
 EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION EQUIPMENT / VEHICLE WASH  
 PW 12-30631, CIP NO. 81134**

<b>DESCRIPTION</b>	<b>TOTAL PRICE (In Figures)</b>
A.) LUMP SUM BID FOR CONSTRUCTION OF EQUIPMENT /VEHICLE WASH FACILITY	\$
B.) LUMP SUM BID FOR TRENCH AND EXCAVATION SAFETY FOR TRENCHES/EXCAVATIONS FIVE FEET DEEP AND GREATER	\$
<b>LUMP SUM BASE BID (A+B)</b>	\$
<b>LUMP SUM BID ADDITIVE 1</b>	\$
<b>LUMP SUM BID ADDITIVE 2</b>	\$
<b>LUMP SUM BID ADDITIVE 3</b>	\$

Determination of the lowest responsive, responsible bidder will be made based on the available construction budget and the Lump Sum Base Bid and Additives listed in the order of priority below whose total does not exceed the construction budget disclosed at the bid opening:

- 1) Lump Sum Bid Additive 3.
- 2) Lump Sum Bid Additive 3 and Lump Sum Bid Additive 2.
- 3) Lump Sum Bid Additive 3, Lump Sum Bid Additive 2, and Lump Sum Bid Additive 1.

The actual construction budget will not be disclosed until after the deadline to receive bids has past and before bids are opened.

**TOTAL BID:**

LUMP SUM BASE BID = \$ \_\_\_\_\_

LUMP SUM BASE BID + LUMP SUM BID ADDITIVE 3 = \$ \_\_\_\_\_

LUMP SUM BASE BID + LUMP SUM BID ADDITIVES 3 & 2 = \$ \_\_\_\_\_

LUMP SUM BASE BID + LUMP SUM BID ADDITIVES 1 & 2 & 3 = \$ \_\_\_\_\_

NOTICE: Bidder's failure to execute the questionnaire and statements contained in this Bid as required by applicable laws and regulations, or the determinations by El Dorado County based upon those questionnaires and statements, may prohibit award of the subject Contract to the Bidder.

### **SUBCONTRACTORS LISTING**

The Bidder shall list the name and address and license number of each subcontractor to whom the Bidder proposes to subcontract portions of the work, as required by the provisions in “Required Listing of Proposed Subcontractors” in Notice to Bidders. The Bidder shall also list the description of work and express the percentage of work to be performed by each subcontractor as subcontracted amount divided by LUMP SUM BASE BID amount.

<b>Name</b>	<b>Location of Business</b>	<b>License No.</b>	<b>Description of Work and Percentage of Work Subcontracted</b>



**MANUFACTURERS:** The Bidder shall list in the space provided herein below one named manufacturer for each item listed in below. Any requests for substitutions for materials and equipment, including specifically those listed below, may only be made in accordance with the Contract Documents. Failure to list a manufacturer for any type of equipment shall constitute submission of a non-responsive bid.

The Bidder hereby represents that Bidder will utilize the following manufacturer for each of the items described below, and will not substitute a different manufacturer without the prior written approval of the County of El Dorado:

SPECIFICATION	ITEM	MANUFACTURER
10 41 16	Emergency Key Cabinets	_____
11 14 00	Vehicle Service Equipment	_____
13 14 19	Prefabricated Metal Building	_____
28 31 11	Addressable Fire-Alarm System	_____

**PUBLIC CONTRACT CODE SECTION 10285.1 STATEMENT**

In accordance with Public Contract Code Section 10285.1 (Chapter 376, Stats. 1985), the Bidder hereby declares under penalty of perjury under the laws of the State of California that the Bidder has\_\_\_\_\_, has not\_\_\_\_\_been convicted within the preceding three years of any offenses referred to in that Section, including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any state or Federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term "Bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1.

**NOTE:** The Bidder must place a check mark after "has" or "has not" in one of the blank spaces provided.

The above Statement is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Statement.

Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

**PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE**

In accordance with Public Contract Code Section 10162, the Bidder shall complete, under penalty of perjury under the laws of the State of California, the following questionnaire:

Has the Bidder, any officer of the Bidder, or any employee of the Bidder who has a proprietary interest in the Bidder, ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

**Yes:** \_\_\_\_\_

**No:** \_\_\_\_\_

If the answer is yes, explain the circumstances in the following space:

**PUBLIC CONTRACT CODE SECTION 10232 STATEMENT**

In accordance with Public Contract Code Section 10232, the Bidder hereby states under penalty of perjury under the laws of the State of California, that no more than one final unappealable finding of contempt of court by a Federal Court has been issued against the Bidder within the immediate preceding two year period because of the Bidder's failure to comply with an order of a Federal Court which orders the Bidder to comply with an order of the National Labor Relations Board.

**NOTE:**

The above Questionnaire and Statement are part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Questionnaire and Statement.

Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

**NONCOLLUSION AFFIDAVIT**  
(Title 23 United States Code Section 112 and  
Public Contract Code Section 7106)

In accordance with Title 23 United States Code, Section 112 and Public Contract Code Section 7106, the Bidder declares 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 the Bidder has not directly or indirectly induced or solicited any other Bidder to put in 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; 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 the 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 the public body awarding the Contract of anyone interested in the proposed Contract; that all statements contained in the bid are true; and, further, that the Bidder has not, directly or indirectly, submitted his or her 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.

**NOTE:**

The above Noncollusion Affidavit is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Noncollusion Affidavit.

Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

Accompanying this proposal is \_\_\_\_\_

(NOTICE: INSERT THE WORDS "CASH (\$\_\_\_)," "CASHIER'S CHECKS," "CERTIFIED CHECKS," OR "BIDDERS BONDS," AS THE CASE MAY BE)

in amount equal to at least ten percent of the total **amount of the Lump Sum Base Bid.**

**The names of all persons interested in the forgoing Proposal as principals are as follows:**

**IMPORTANT NOTICE:** If the Bidder or other interested person is a corporation, state legal name of corporation and place of incorporation, also names of the president, secretary, treasurer, and executive officer thereof; if a partnership, state name of partnership, also names of all individual partners; if Bidder or other interested person is an individual, state first and last names in full.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Licensed in accordance with an act providing for the registration of Contractors,

License No. \_\_\_\_\_ Classification(s) \_\_\_\_\_

**A copy of the afore-referenced license must be attached hereto.**

**ADDENDA:** This Proposal is submitted with respect to the changes to the Contract included in addenda number(s)

\_\_\_\_\_

(Fill in addenda numbers if addenda have been received and insert, in this Proposal, any Proposal Pay Items and Bid Price Schedules that were received as part of the addenda)

By my signature on this Proposal I certify, under penalty of perjury under the laws of the State of California, that the foregoing questionnaire and statements of Public Contract Code Sections 10162, 10232, and 10285.1 are true and correct and that I have complied with the requirements of Section 8103 of the Fair Employment and Housing Commission Regulations (Chapter 5 of Division 4 of Title 2 of the California Code of Regulations). By my signature on this Proposal I further certify, under penalty of perjury under the laws of the State of California and the United States of America that the Noncollusion Affidavit required by Title 23 United States Code, Section 112 and Public Contract Code Section 7106 is true and correct.

The person or persons executing this Proposal on behalf of a corporation or partnership shall be prepared to demonstrate by resolution, article, or otherwise, that such person is or that such persons are appropriately authorized to act in these regards for such corporation or partnership. Such authority shall be demonstrated to the satisfaction of the County of El Dorado.

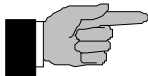
If the signature is by an agent other than an officer of a corporation or a member of a partnership, a power of attorney authorizing said act by the agent on behalf of his principal shall be submitted with the bid forms; otherwise, the bid may be disregarded as irregular and unauthorized.

The Bidder's execution on the signature portion of this Proposal shall constitute an endorsement and execution of those affidavits, declarations and certifications which are part of this Proposal.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

at \_\_\_\_\_ County, State of \_\_\_\_\_

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



**SIGN HERE** \_\_\_\_\_

Name and Title of Bidder \_\_\_\_\_

Name of Firm \_\_\_\_\_

**END OF PROPOSAL**

**COUNTY OF EL DORADO**

**BIDDER'S BOND**

**this form MUST be used**

**KNOW ALL PEOPLE BY THESE PRESENTS, THAT WE** \_\_\_\_\_  
\_\_\_\_\_, as **PRINCIPAL**, and  
\_\_\_\_\_

as Surety are held and firmly bound unto the County of El Dorado (Obligee), in the penal sum of **TEN (10) PERCENT OF THE AMOUNT OF THE TOTAL LUMP SUM BASE BID PRICE** of the Principal above named, submitted by said Principal to the Obligee for the work described below, for the payment of which sum in lawful money of the United States, well and truly to be made to the Obligee, we the Principal and Surety bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents. In no case shall the liability of the Surety hereunder exceed the sum of

**TEN PERCENT (10%) OF THE AMOUNT OF THE TOTAL LUMP SUM BASE BID PRICE**

**THE CONDITION OF THIS OBLIGATION IS SUCH, THAT:**

**WHEREAS**, the Principal has submitted the above-mentioned Bid to the Obligee, as aforesaid, for certain construction specifically described as follows, for which bids are to be opened at Placerville, El Dorado County, California, for the construction of the

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION**  
**EQUIPMENT / VEHICLE WASH FACILITY**  
**CONTRACT NO. PW 12-30631, CIP NO. 81134**

**NOW, THEREFORE**, if the aforesaid Principal is awarded the Contract and, within the time and manner required under the Contract Documents, after the prescribed forms are presented to it for signature, enters into a written contract, in the prescribed form, in accordance with the Bid, and files two bonds with the County of El Dorado, one to guarantee faithful performance and the other to guarantee payment for labor and materials, as required by law, then this obligation shall be null and void; otherwise, it shall remain in full force and virtue.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorney's fee to be fixed by the Court.

**IN WITNESS WHEREOF**, we have set our hands and seals on this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_

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

(seal) \_\_\_\_\_  
Surety

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

(NOTE: Signature of those executing for the Surety shall be properly acknowledged, and accompanied by a Certificate of Acknowledgment.)

# SURETY

## ACKNOWLEDGMENT

State of California

County of \_\_\_\_\_

On \_\_\_\_\_ before me, \_\_\_\_\_,  
(here insert name and title of the officer)

personally appeared \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature \_\_\_\_\_

(Seal)



# County of El Dorado, State of California

## Department of Transportation

Contract No. PW 12-30631, CIP No. 81134

### El Dorado County Department of Transportation Equipment / Vehicle Wash Facility

**THIS AGREEMENT** ("Agreement") approved by the Board of Supervisors this \_\_\_\_\_ day of \_\_\_\_\_, in the year of \_\_\_\_\_, made and concluded, in duplicate, between the COUNTY OF EL DORADO, a political subdivision of the State of California, by the Department of Transportation thereof, the party of the first part hereinafter called "County," and (Contractor) \_\_\_\_\_ party of the second part hereinafter called "Contractor."

#### **RECITALS:**

**WHEREAS**, County has caused the above-captioned project to be let to formal bidding process; and

**WHEREAS**, Contractor has duly submitted a bid response for the captioned project upon which County has awarded this Contract;

**NOW, THEREFORE**, the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree, each with the other, as follows:

#### **Article 1. THE WORK**

The improvement contemplated in the performance of this Contract is an improvement over which the County of El Dorado shall exercise general supervision. The County therefore, shall have the right, but not the duty to assume full and direct control over this Contract whenever the County at its sole discretion, shall determine that its responsibility is so required.

The Contractor shall complete the Work as specified or indicated under the Bid Schedule(s) of the County's Contract Documents entitled:

### EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION EQUIPMENT / VEHICLE WASH FACILITY

The project is located at 2441 Headington Road, in Placerville in El Dorado County. The Work to be done is shown on the Plans, and generally consists of, but is not limited to:

- A. The Work will be bid as a LUMP SUM BASE BID, LUMP SUM BID ADDITIVE 1, LUMP SUM BID ADDITIVE 2 and LUMP SUM BID ADDITIVE 3.
- B. LUMP SUM BASE BID: **Total of LUMP SUM BID** for Construction of a vehicle wash facility, including a prefabricated building with metal siding and roofing with a steel structure, foundation, CMU splash walls, a 2-stage, 2-level wash bay, equipment room, sump pit and associated underground utility improvements **PLUS LUMP SUM BID** for Trench and Excavation Safety for Trenches and Excavations five feet deep and greater. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.
- C. LUMP SUM BID ADDITIVE 1: Construction and installation of the metal catwalks in the "heavy solids / cold wash area" as shown on the plans along grid lines 1.1 and 2, between Grids A to C, including stair sections at Grid A and four (4) bollards at stair sections. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.

- D. LUMP SUM BID ADDITIVE 2: Construction and installation of the metal catwalks in the “hot water pressure wash area” as shown on the plans along grid lines 1.1 and 2, between Grids C to E, including stair sections at Grid E and four (4) bollards at stair sections. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.
- E. LUMP SUM BID ADDITIVE 3: Provide and install washing equipment. Refer to Contract Drawings A2.0, M2.1, P2.1 and E2.1. Refer to Specification Section 11 14 00 Vehicle Service Equipment. Other items or details not mentioned above, that are required by the plans or these Contract Documents shall be performed, constructed or installed.

## **Article 2. CONTRACT DOCUMENTS**

The Contract Documents consist of: the Notice to Bidders; the bid forms which include the accepted Proposal, Proposal Lump Sum Bid Price Schedule, Subcontractors Listing, Section 10285.1 Statement, Section 10162 Questionnaire, Section 10232 Statement, and the Noncollusion Affidavit; the Contract which includes this Agreement with all Exhibits thereto, the Performance Bond and Payment Bond; Conditions of the Contract; the drawings listed and identified as the Project Plans; the Technical Specifications and standard drawings from the Design and Improvement Standards Manual of the County of El Dorado, revised March 8, 1994 including Resolutions 199-91 and 58-94 to adopt changes to the Design and Improvement Standards Manual; all Addenda incorporated in those documents before their execution, and all Architect’s Supplemental Instructions, Construction Change Directives, and Contract Change Orders issued in accordance with the Contract Documents which may be delivered or issued after the Effective Date of this Agreement and are not attached hereto; the prevailing Labor Surcharge And Equipment Rental Rates (when required) as determined by the Department of Industrial Relations to be in effect on the date the Work is accomplished; all the obligations of County and of Contractor which are fully set forth and described therein; and all Contract Documents which are hereby specifically referred to and by such reference made a part hereof. All Contract Documents are intended to cooperate so that any work called for in one and not mentioned in the other is to be executed the same as if mentioned in all Contract Documents. Contractor agrees to perform all of its promises, covenants, and conditions set forth in the Contract Documents, and to abide by and perform all terms and conditions set forth therein. In case of conflict between this Agreement and any other contract document, this Agreement shall take precedence.

## **Article 3. CONTRACT PRICE**

As compensation agreed upon for said Work, County shall pay or cause to be paid to Contractor, in full, and for the full contract price and compensation for said completion of the Work, including without limitation, all bonds and insurance, THE NOT TO EXCEED SUM OF (insert dollar amount in words) DOLLARS \$(insert dollar amount in numbers)) which sum constitutes the Contract Price for the complete Project (the “Contract Price”).

## **Article 4. COMMENCEMENT AND COMPLETION**

The Work to be performed under this Contract shall commence on the date specified in the Notice to Proceed issued by County. The work shall be diligently prosecuted to completion before the expiration of **One Hundred Ten (110) WORKING DAYS** from the date specified in the Notice to Proceed.

County and Contractor recognize that time is of the essence of the Agreement and that County will suffer financial loss if the Work is not completed within the time specified in the above paragraph, plus any extensions thereof allowed in accordance with Article 4.3.5 of the Conditions of the Contract. They also recognize the delays, expense, and difficulties involved with proving in a legal proceeding the actual loss suffered by County if the Work is not completed on time. Accordingly, instead of requiring any such proof, County and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay County the sum of **Two Thousand dollars (\$2,000.00) per day**, as liquidated damages and not as a penalty, for each and every calendar day’s delay in finishing the Work in excess of the contract time prescribed herein.

**Article 5. INDEMNITY**

To the fullest extent allowed by law, Contractor shall defend, indemnify, and hold the County and its officers, directors, and employees harmless against and from any and all claims, suits, losses, damages, and liability for damages, including attorney's fees and other costs of defense brought for or on account of injuries to or death of any person, including but not limited to, workers and the public, or on account of injuries to or death of County employees, or damage to property, or any economic, consequential or special damages which are claimed or which shall in any way arise out of or be connected with Contractor's services, operations or performance hereunder, regardless of the existence or degree of fault or negligence on the part of the County, the Contractor, subcontractors or employees of any of these, except for the active, or sole negligence of the County, its officers and employees, or where expressly prescribed by statute.

The duty to indemnify and hold harmless the County specifically includes the duties to defend set forth in Section 2778 of the Civil Code. The insurance obligations of the Contractor are separate, independent obligations under the Contract Documents, and the provisions of this defense and indemnity are not intended to modify nor should they be construed as modifying or in any way limiting the insurance obligations set forth in the Contract Documents.

**Article 6. GUARANTEES**

Contractor shall repair or replace any or all work provided hereunder which is defective due to faulty materials, poor workmanship, or defective equipment at no expense to County, ordinary wear or tear and unusual abuse or neglect excepted, during the term of the Contract and for a period of one (1) year after contract Acceptance. Contractor shall be required to repair or replace any and all adjacent facilities or areas which have been damaged or displaced due to Contractor work performed under this Agreement at no expense to County during the term of this Contract and for a period of one (1) year after Contract Acceptance.

If a warranty or guarantee exceeding one (1) year is provided by the supplier or manufacturer of any equipment or materials used in this Project, or if a warranty or guarantee exceeding one (1) year is required elsewhere in these Contract Documents, then the guarantee for such equipment or materials shall be extended for such term. Contractor expressly agrees to act as co-guarantor of such equipment and materials, and Contractor shall supply County with all warranty and guaranty documents relative to equipment and materials incorporated in the job and guaranteed by its suppliers or manufacturers.

The parties agree that this guarantee and the rights and obligations accruing therefrom shall be in addition to, and not by way of limitation in any manner whatsoever to, the rights, obligations, warranties or remedies otherwise provided for by law.

In the event of Contractor's failure to comply with the above mentioned conditions within ten (10) calendar days after being notified in writing by County, Contractor hereby authorizes County to proceed to have said defects repaired and made good at Contractor's expense, and Contractor will honor and pay all costs and charges therefore upon written demand.

**Article 7. NOTICE**

Any notice or other correspondence required to be given under this Agreement by either party to the other may be affected by personal delivery in writing or by mail, postage prepaid. Notices personally delivered during normal business hours shall be deemed received on the actual date of delivery; mailed notices shall be deemed received one (1) day after affixed postmark. Notices and correspondence to County shall be in duplicate and shall be delivered to it as follows:

To County:

County of El Dorado  
Department of Transportation  
2850 Fairlane Court  
Placerville, California 95667

Attn.: Matthew D. Smeltzer, P.E.  
Deputy Director, Engineering  
Engineering Division

With a Copy To:

County of El Dorado  
Department of Transportation  
2850 Fairlane Court  
Placerville, California 95667

Attn.: Janel Gifford, P.E.  
Office Engineer/Contract Services Unit

Notices and correspondence to Contractor shall be delivered when personally delivered to, or if mailed, addressed to Contractor at:

Contractor's Business Name  
Street Address  
City, State Zip

Attn.: Name of Notices Recipient  
Title of Notices Recipient

Either party may change its address for notices by giving written notice pursuant to this Article.

**Article 8. VENUE**

Any litigation arising out of this Contract shall be brought in El Dorado County.

**Article 9. NOTIFICATION OF SURETY COMPANY**

The surety company shall familiarize itself with all of the conditions and provisions of this Contract, and shall waive the right of special notification of any change or modifications of this Contract or extension of time, or of decreased or increased work, or of the cancellation of the Contract, or of any other act or acts by County or its authorized agents, under the terms of this Contract; and failure to so notify the aforesaid surety company of changes shall in no way relieve the surety company of its obligation under this Contract.

**Article 10. ASSIGNMENT OF ANTITRUST ACTIONS**

In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor offers and agrees and will require all of its subcontractors and suppliers to agree 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. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 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 the awarding body tenders final payment to Contractor, without further acknowledgment by the parties.

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Government Code Sections 4550-4554, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under Government Code Sections 4550-4554 if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

**Article 11. TERMINATION BY COUNTY FOR CONVENIENCE**

County reserves the right to terminate the Contract at any time upon determination by County's representative that termination of the Contract is in the best interest of County. County shall issue Contractor a written notice specifying that the Contract is to be terminated.

Upon receipt of said written notice, Contractor shall stop all work under the Contract except: (1) work specifically directed to be completed prior to termination, (2) work the Inspector deems necessary to secure the project for termination, (3) removal of equipment and plant from the site of the Work, (4) action that is necessary to protect materials from damage, (5) disposal of materials not yet used in the Work as directed by County, and (6) clean up of the site.

If the Contract is terminated for County's convenience as provided herein, all finished or unfinished work and materials previously paid for shall, at the option of County, become its property. Contractor shall be paid an amount which reflects costs incurred for work provided to the date of notification of termination. In addition, Contractor shall be paid the reasonable cost, as solely judged by County, and without profit, for all work performed to secure the project for termination.

**Article 12. TERMINATION BY COUNTY FOR CAUSE**

If Contractor is adjudged as bankrupt or insolvent, or makes a general assignment for the benefit of its creditors or if a trustee or receiver is appointed for Contractor or for any of its property, or if Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or on more than one occasion fails to supply sufficient skilled workmen or suitable material or equipment, or on more than one occasion fails to make prompt payments to subcontractors for labor, materials, or equipment, or disregards the authority of the County's representative, or the Engineer, if one is appointed, or otherwise violates any provision of the Contract Documents, then County may, without prejudice to any other right or remedy and after giving Contractor and its Surety a minimum of ten (10) days from delivery of a written termination notice, terminate the services of Contractor and take equipment and machinery thereon owned by Contractor and finish the Work by whatever method County may deem expedient. In such case, Contractor shall not be entitled to receive any further payment until the Work is finished.

Without prejudice to other rights or remedies County may have, if Contractor fails to begin delivery of materials and equipment, to commence Work within the time specified, to maintain the rate of delivery of material, to execute the Work in the manner and at such locations as specified, or fails to maintain a work program which will ensure County's interest, or, if Contractor is not carrying out the intent of the Contract, an Inspector's written notice may be served upon Contractor and the Surety on its faithful performance bond demanding satisfactory compliance with the Contract. If Contractor or its Surety does not comply with such notice within five (5) days after receiving it, or after starting to comply, fails to continue, County may exclude it from the premises and take possession of all material and equipment, and complete the Work by County's own forces, by letting the unfinished Work to another Contractor, or by a combination of such methods.

Where Contractor's services have been so terminated by County, said termination shall not affect any right of County against Contractor then existing or which may thereafter accrue. Any retention or payment of monies by County due Contractor will not release Contractor from compliance with the Contract Documents.

If the unpaid balance of the Contract price exceeds the direct and indirect costs of completing the Work, including compensation for additional professional services, such excess shall be paid to Contractor. If the sums under the Contract are insufficient for completion, Contractor or Surety shall pay to County within five (5) days after the completion, all costs in excess of the Contract price. In any event, the cost of completing the Work shall be charged against Contractor and its Surety and may be deducted from any money due or becoming due from County.

The provisions of this Article shall be in addition to all other rights and remedies available to County under law.

If after notice of termination, it is determined for any reason that Contractor was not in default, the rights and obligations of the parties shall be the same as if the notice of termination had not been issued. The Contract shall be equitably adjusted to compensate for such termination.

**Article 13. SUCCESSORS AND ASSIGNS**

This Agreement shall bind and inure to the heirs, devisees, assignees, and successors in interest of Contractor and to the successors in interest of County in the same manner as if such parties had been expressly named herein.

**Article 14. REPORTING ACCIDENTS**

Contractor shall prepare and submit (within 24 hours of such incidents) reports of accidents at the site and anywhere else the work is in progress in which bodily injury is sustained or property loss in excess of Five Hundred Dollars (\$500.00) occurs.

**Article 15. WORKERS' COMPENSATION CERTIFICATION**

Contractor shall comply with Labor Code Sections 3700 et seq., requiring it to obtain Workers' Compensation Insurance, and sign a certificate of knowledge thereof.

**CERTIFICATE OF KNOWLEDGE - LABOR CODE SECTION 3700**

I am 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 I will comply with such provisions before commencing the performance of work of this Contract.

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

**Article 16. WARRANTY**

Contractor warrants to County that materials and equipment furnished for the Work will be of good quality and new, unless otherwise required or permitted under the Contract Documents, that the Work will be free from defects or flaws and is of the highest quality of workmanship and that the Work will conform with the requirements herein. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective.

**Article 17. RETAINAGE**

The retainage from payments is set forth in Section "PAYMENT OF WITHHELD FUNDS" of the Special Provisions. Contractor may elect to receive one hundred percent (100%) of payments due as set forth in the Contract Documents, without retention, by depositing securities of equivalent value with County, in accordance with, and as set forth in Section 22300 of the Public Contract Code. Securities eligible for deposit hereunder shall be limited to those listed in Section 16430 of the Government Code, or bank or savings and loan certificates of deposit.

**Article 18. PREVAILING WAGE REQUIREMENTS**

In accordance with the provisions of California Labor Code Sections 1770 et seq., the general prevailing rate of wages in the county in which the Work is to be done has been determined by the Director of the California Department of Industrial Relations. These wage rates appear in the California Department of Transportation publication entitled General Prevailing Wage Rates. Interested parties can obtain the current wage information by submitting their requests to the Department of Industrial Relations, Division of Labor Statistics and Research, PO Box 420603, San Francisco CA 94142-0603, Telephone (415) 703-4708 or by referring to the website at <http://www.dir.ca.gov/dlsr/PWD>. The rates at the time of the bid advertisement date of a project will remain in effect for the life of the project in accordance with the California Code of Regulations, as modified and effective January 27, 1997.

Copies of the general prevailing rate of wages in the county in which the Work is to be done are also on file at the Department of Transportation's principal office, and are available upon request.

In accordance with the provisions of Labor Code 1810, eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and Contractor and any subcontractor employed under this Contract shall conform to and be bound by the provisions of Labor Code Sections 1810 through 1815.

**Article 19. BUSINESS LICENSE**

The County Business License Ordinance provides that it is unlawful for any person to furnish supplies or services, or transact any kind of business in the unincorporated territory of El Dorado County without possessing a County business license unless exempt under County Ordinance Code Section 5.08.070. Contractor warrants and represents that it shall comply with all of the requirements of the County Business License Ordinance, where applicable, prior to beginning work under this Contract and at all times during the term of this Contract.

**Article 20. CONTRACT ADMINISTRATOR**

The County Officer or employee with responsibility for administering this Agreement is John Kahling, Deputy Director, Construction Division, 2441 Headington Rd, Placerville, CA, Department of Transportation, or successor.

**Article 21. AUTHORIZED SIGNATURES**

The parties hereto represent that the undersigned individuals executing this Agreement on their behalf are fully authorized to do so by law or other appropriate instrument and to bind upon said parties the obligations set forth herein.

**Article 22. PARTIAL INVALIDITY**

If any provision of this Agreement is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remaining provisions will continue in full force and effect without being impaired or invalidated in any way.

**Article 23. ENTIRE AGREEMENT**

This document and the documents referred to herein or exhibits hereto are the entire Agreement between the parties and they incorporate or supersede all prior written or oral agreements or understandings.

**IN WITNESS WHEREOF**, the said Department of Transportation of the County of El Dorado, State of California, has caused this Agreement to be executed by County's Board of Supervisors, on its behalf, and the said Contractor has signed this Agreement the day and year written below.

**COUNTY OF EL DORADO**

Dated \_\_\_\_\_

\_\_\_\_\_  
Chairman, Board of Supervisors

Attest:  
Terri Daly,  
Acting Clerk of the Board of Supervisors

Dated \_\_\_\_\_

By: \_\_\_\_\_  
Deputy Clerk

**CONTRACTOR**

Dated \_\_\_\_\_

\_\_\_\_\_  
Name of Company

By \_\_\_\_\_  
Authorized Representative

\_\_\_\_\_  
License No.

\_\_\_\_\_  
Federal Employer Identification No.

NOTE: If Contractor is a corporation, the legal name of the corporation shall be set forth above together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if Contractor is a co-partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts on behalf of the co-partnership; and if Contractor is an individual, his/her signature shall be placed above. Contractor executing this document on behalf of a corporation or partnership shall be prepared to demonstrate by resolution, article, or otherwise that it is appropriately authorized to act in these regards. For such corporation or partnership, such authority shall be demonstrated to the satisfaction of County. If signature is by an agent, other than officer of a corporation or a member of a partnership, an appropriate Power of Attorney shall be on file with the Department prior to signing this document.

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

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

City, Zip: \_\_\_\_\_

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

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

**END OF CONTRACT**



COUNTY OF EL DORADO

PERFORMANCE BOND

Bond No. \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, that we \_\_\_\_\_

the Contractor in the Contract hereto annexed, as Principal, and \_\_\_\_\_

as Surety, are held firmly bound unto the County of El Dorado, a political subdivision of the State of California, hereinafter called

the "Obligee" in the sum of \_\_\_\_\_ DOLLARS,

(\$ \_\_\_\_\_ ) lawful money of the United States, for which payment, well and truly to be made, we

bind ourselves, jointly and severally, firmly by these presents.

Signed, sealed and dated: \_\_\_\_\_

The condition of the above obligation is such that if said Principal as Contractor in the Contract hereto annexed shall faithfully perform each and all of the conditions of said Contract to be performed by him, and shall furnish all tools, equipment, apparatus, facilities, transportation, labor and material, other than material, if any, agreed to be furnished by the Obligee, necessary to perform and complete, and to perform and complete in a good and workmanlike manner, the work of **Contract No. PW12-30631, CIP No. 81134 for the EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION EQUIPMENT / VEHICLE WASH FACILITY** in strict conformity with the terms and conditions set forth in the Contract hereto annexed, then this obligation shall be null and void; otherwise this bond shall remain in full force and effect and the said Surety will complete the Contract work under its own supervision, by Contract or otherwise, and pay all costs thereof for the balance due under terms of the Contract, and the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorney's fee to be fixed by the court.

This guarantee shall insure the Obligee during the work required by any Contract and for a period of one (1) year from the date of acceptance of the work against faulty or improper materials or workmanship that may be discovered during that time.

No right of action shall accrue under this bond to or for the use of any person other than the Obligee named herein.

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

Correspondence or Claims relating to this bond should be sent to the Surety at the following address:

_____	_____
	PRINCIPAL
_____	_____
	SURETY
_____	_____
	ATTORNEY-IN-FACT

NOTE: Signatures of those executing for the Principal and the Surety must be properly acknowledged, and a Power of Attorney attached for the Surety.

NOTARY ACKNOWLEDGMENTS ATTACHED

**PRINCIPAL**

**ACKNOWLEDGMENT**

State of California

County of \_\_\_\_\_

On \_\_\_\_\_ before me, \_\_\_\_\_,  
(here insert name and title of the officer)

personally appeared \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature \_\_\_\_\_

(Seal)

# SURETY

## ACKNOWLEDGMENT

State of California

County of \_\_\_\_\_

On \_\_\_\_\_ before me, \_\_\_\_\_,  
(here insert name and title of the officer)

personally appeared \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature \_\_\_\_\_

(Seal)

**COUNTY OF EL DORADO**

**PAYMENT BOND**

(Section 3247, Civil Code)

Bond No. \_\_\_\_\_

WHEREAS, the County of El Dorado, a political subdivision of the State of California, hereafter referred to as "Obligee", has awarded to Contractor

\_\_\_\_\_ hereafter referred to as "Principal", a contract for the work described as follows:

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY  
CONTRACT NO. PW 12-30631, CIP NO. 81134**

AND, WHEREAS, said Principal is required to furnish a bond in connection with said contract, guaranteeing the faithful performance thereof:

NOW, THEREFORE, we the undersigned Principal and Surety are held and firmly bound unto the Obligee, in the sum of \_\_\_\_\_ Dollars, (\$ \_\_\_\_\_) to be paid to the Obligee, for which payment we bind ourselves, jointly and severally.

**THE CONDITION OF THIS OBLIGATION IS SUCH,**

That if said Principal or its subcontractors shall fail to pay any of the persons named in Civil Code Section 3181, or amounts due under the Unemployment Insurance Code with respect to work or labor performed by such claimant, or any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the Principal and his subcontractors pursuant to Section 18806 of the Revenue and Taxation Code, with respect to such work and labor, that the Surety herein will pay for the same in an amount not exceeding the sum specified in this bond, otherwise the above obligation shall be void. In case suit is brought upon this bond, the Surety will pay a reasonable attorney's fee to be fixed by the court.

This bond shall inure to the benefit of any of the persons named in Civil Code Section 3181 as to give a right of action to such persons or their assigns in any suit brought upon this bond.

Dated: \_\_\_\_\_

Correspondence or Claims relating to this bond should be sent to the Surety at the following address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
PRINCIPAL  
\_\_\_\_\_  
SURETY  
\_\_\_\_\_  
ATTORNEY-IN-FACT

NOTE: Signatures of those executing for the Principal and for the Surety must be properly acknowledged, and a Power of Attorney attached for the Surety.

**NOTARY ACKNOWLEDGMENTS ATTACHED**

**PRINCIPAL**

**ACKNOWLEDGMENT**

State of California

County of \_\_\_\_\_

On \_\_\_\_\_ before me, \_\_\_\_\_,  
(here insert name and title of the officer)

personally appeared \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ ,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature \_\_\_\_\_

(Seal)

# SURETY

## ACKNOWLEDGMENT

State of California

County of \_\_\_\_\_

On \_\_\_\_\_ before me, \_\_\_\_\_,  
(here insert name and title of the officer)

personally appeared \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ ,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature \_\_\_\_\_

(Seal)

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY  
CONTRACT NO. PW 12-30631, CIP No. 81134**

**CONDITIONS OF THE CONTRACT**

**Article 1**

**GENERAL PROVISIONS**

**1.1 BASIC DEFINITIONS**

1.1.1 County: The County of El Dorado, a political subdivision of the State of California.

1.1.2 Owner: The County of El Dorado is the Owner and is identified as the Owner in the Contract and these Contract Conditions. The term Owner, and pronouns in place of the same shall mean the County of El Dorado acting by and through its duly authorized representative.

1.1.3 Owner's Representative: The Director of Transportation, or designated representative.

1.1.4 Architect: The person holding a valid California State Architect's license, whose firm has been designated within the Contract Documents as the Architect to provide services on the Project, and whom may have engaged engineering sub-consultants to provide services on the Project. When the Architect is referred to within the Contract Documents and no Architect has in fact been designated, then the matter shall be referred to the County. The term Architect shall be construed to include all of his consultants retained for the project, as well as employees of the Architect. When the designated Architect is an employee of the County, his authorized representations on the project within the County will be included under the term Architect.

1.1.5 Project Manager: Project Manager, or such other designated representative of the Owner. The Project Manager has such duties and authority as may be set forth in the Contract Documents.

1.1.6 Contractor: The person or entity identified as such in the Contract and is referred to throughout the Contract Documents as if singular in number. The term Contractor refers to the Contractor or the Contractor's authorized representative.

1.1.7 Inspector: The individual designated by the Owner as the Inspector as set forth in Paragraph 2.1.2.

1.1.8 Subcontractor: Those contractors, of what ever tier, furnishing labor or material, or both, for the Work under the Contract with the Contractor.

1.1.9 Substantial Completion: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

1.1.10 Final Acceptance: Conditions upon which the County will accept Work as satisfactorily completed in accordance with the Contract Documents. Requirements include, but are not limited to;

1. All Systems having been tested and accepted as having met requirements of the Contract Documents.
2. All required instructions and training sessions having been given by the Contractor.
3. All as-built drawings and operations & maintenance manuals, having been submitted by the Contractor, reviewed by the Architect, and accepted by the Owner.
4. All punch list work, as directed by the Owner, having been completed by the Contractor.
5. Acceptance of the Work by the Board of Supervisors.

- 1.1.11 **Final Payment:** The Final Payment shall be the last Progress Payment made to Contractor and shall not be considered to be the payment of any or all of the retention.
- 1.1.12 **Architect's Supplemental Instructions/Instruction Bulletins:** A written order of the Architect and reviewed by the Owner's Representative directing the Contractor to provide supplemental instructions, interpretations, or conduct minor changes in work involving neither extra cost nor extra time and being consistent with the scope and functioning of the project.
- 1.1.13 **Construction Change Directive:** A written order issued by the Architect and signed by the Owner directing a change in the Work and stating a proposed basis for adjustment, if any, of Contract Time or Sum. The Owner may by Change Directive, without invalidating the Contract and without Contractor's agreement, order changes in the Work. This procedure will be used in the absence of agreement between Owner and Contractor, for subsequent inclusion in a Change Order.
- 1.1.14 **Change Order:** A Change Directive signed by the Owner and Contractor stating their agreement upon all of the following: 1) a change in the Work, 2) the amount of the adjustment in the Contract Price, if any, and 3) the extent of the adjustment in the Contract Time, if any.
- 1.1.15 **Contract Documents:** The Contract Documents shall include the documents described in Article 2 of the Contract, including Architect's Supplemental Instructions, Construction Change Directives, and Change Orders.
- 1.1.16 **Work:** The construction and services required by the Contract Documents, including all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations.
- 1.1.17 **Project:** The total construction of the Work performed under the Contract Documents.
- 1.1.18 **Plans:** The graphic and pictorial portions of the 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, specifically the Plans entitled "El Dorado County Department of Transportation Equipment/Vehicle Wash Facility."
- 1.1.19 **Technical Specifications:** That portion of the Contract Documents Division 1 through 41 consisting of the technical written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.
- 1.1.20 **Claim:** A demand or assertion by the Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract. Claims must be made by written notice and shall include a demand for the Owner's decision. The responsibility to substantiate claims and to resolve the claims of subcontractors of whatever tier shall rest with the Contractor.
- 1.1.21 **Work Not Included:** Except for such auxiliary work as shown or specified, or is necessary as part of the construction, the following is NOT included in this contract: Any work shown but marked "Not in Contract" (NIC) or otherwise designated to be done under another contract or by Owner.
- 1.1.22 **Furnish (material):** To supply and deliver to the project ready for installation and in operating condition.
- 1.1.23 **Install (service or labor):** To place in final position, complete, anchored, connected, and in operable condition with respect to required codes and/or governing agency requirements.
- 1.1.24 **Provide:** To furnish and install complete. When "Furnish", "Install", or "Provide" is stated, "Provide" is implied.



1.1.25 **Construct:** To “Furnish” materials to “Install” in final position, complete, anchored, and connected with respect to required codes, requirements, Contract Documents, and details.

1.1.26 **Day(s):** All references to “day” or “days” in these Contract Documents shall be defined as calendar-day or calendar-days.

## **1.2 CONTRACT DOCUMENTS**

1.2.1 **One Document:** The Contract Documents are one document and any work shown or mentioned shall be performed or furnished. The Contractor admits and agrees that the Contract Documents exhibit the intent and purpose of the Owner in regard to the Work, and that they are not complete in every detail and are to be considered as showing the purpose and intent only; and he further agrees to furnish all labor or material for any detail that is necessary to carry out the intent and purpose of the Specifications without extra charge.

1.2.2 **Misuse of Words or Punctuation:** The misplacement, addition, or omission of any word, letter, or punctuation mark will not in any way change the intent or meaning of the Contract Documents. Any part of the Work, or any article pertaining thereto which is not specifically set forth in these Contract Documents, but which is necessary for the proper completion of the Work, is to be supplied and set in place at the Contractor's expense, the same as if it had been mentioned in these Contract Documents. The Contractor shall furnish all things necessary to make a good and workmanlike job in accordance with the intent and purpose of the Contract Documents.

## **1.3 ASSIGNMENT OF CONTRACT**

1.3.1 **Mutual Consent:** Neither party to the Contract shall assign the Contract without the written consent of the other party, nor shall the Contractor assign any moneys due or to become due to him hereunder without the written consent of the Owner.

1.3.2 **Assignment Under Anti-Trust Claims:** In accordance with Section 4552 of the California Government Code, and Section 7103 of the Public Contract Code, Contractor and subcontractors shall conform to the following requirements:

1. In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, Contractor or subcontractors offers and agrees to assign to the Owner 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 Section 15) or under the Cartwright Act, [Chapter 2 (commencing with Section 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 the Owner tenders Final Payment to the Contractor, without further acknowledgment by the parties.
2. If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Government Code Sections 4550-4554, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under Government Code Sections 4550-4554 if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

**1.4 WAIVER OF "COMMON PRACTICE"**

1.4.1 The Contractor shall waive "common practice" and "common usage" as construction criteria wherever the Contract Documents details, plans, technical specifications, governing codes, or ordinances require greater quantity or better quality than common practice or common usage would require.

**1.5 EXCESSIVE COSTS**

1.5.1 Failure to Comply with Contract: If Contractor fails to comply with any Contract requirements, including any required coordination with other contractors, and that failure results in additional costs to Owner, then Contractor shall be liable for such additional costs.

1.5.2 Construction Methods: If Contractor's construction methods and techniques result in additional costs to Owner, after notice, such Contractor shall be responsible for cost attributable to his methods and techniques.

**Article 2**

**OWNER**

**2.1 OWNER'S REPRESENTATIVE**

2.1.1 Owner Representative: The Owner will be represented by the Owner's Representative who shall oversee the performance of the Contract on behalf of the Owner.

2.1.2 Owner May Appoint Inspector: Owner shall be entitled to appoint an agent as Inspector who shall see that the performance of the Work is in strict accordance with the Contract Documents on behalf of the Owner.

2.1.3 Communication: In order that the Owner may act upon expert advice and upon good procedure, all communications from the Contractor shall be in writing and will be through said Owner's Representative or Inspector, as the Owner may direct, and all communications and instructions from the Owner to the Contractor will be so routed. The Owner reserves the right to alter this procedure without the consent of the Contractor. All communications not in compliance herewith, shall be considered non-binding on the Owner.

**2.2 RIGHTS OF OWNER**

2.2.1 Right to Clean Up: Subject to the strict prohibition against maintaining a nuisance, if a dispute arises between the Contractor, Subcontractors, or separate contractors as to the responsibility under their respective Contracts for maintaining the premises and surrounding area free from waste materials and rubbish the Owner may, but need not, clean up and allocate the cost among those responsible as the Inspector determines to be just.

2.2.2 Right to Accept Imperfect Work: If any part or portion of the Work completed under this Contract is defective and not in accordance with the Plans or Contract Documents, and if the imperfection is judged by Owner to be not of sufficient magnitude or importance so as to make the Work unacceptable, then Owner shall have the right and authority to retain such Work but will make such deductions in Contract Price as may be equitable and reasonable. However, Owner does not by this section waive any other rights provided for herein.

2.2.3 Right to do Adjacent Work: The Owner reserves the right to perform construction or operations on the site of the Work. In doing this Owner may use its own forces or award separate contracts in connection with other construction or operations on the site but not covered by the Contract Documents. Contractor shall defend, indemnify, and hold Owner harmless for costs incurred by Owner that are payable to a

separate contractor because of delays, improperly timed activities, or defective construction by the Contractor, unless such costs are incurred due to the sole or active negligence of Owner.

2.2.4 **Right to Finish Contractor's Work:** If the Contractor defaults or neglects to carry out all or any part of the Work in accordance with the Contract Documents, the Owner has the right, exercisable solely at Owner's discretion, to commence and continue completion of the Work with diligence and promptness. In such an event, if the Owner's cost to complete to Work exceeds the remaining balance of the Contract with the Contractor, Contractor shall reimburse the Owner for such excess costs.

2.2.5 **Right of Partial Use of Project:** The Owner may occupy or use any completed or partially completed portion of the Work at any stage, upon agreement of Owner and Contractor.

1. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents.
2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.
3. Immediately prior to such partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.
4. Unless otherwise agreed upon in writing, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of work not complying with the requirements of the Contract Documents.
5. No claim for acceleration, delay, or hindrance, may be made by Contractor on his own behalf or that of any of his subcontractors, for any delays, accelerations, or hindrances that may arise out of Owner's partial occupancy of the Project.

2.2.6 **Right to Audit:** Contractor shall maintain and make available to the County, State Auditor, or to any of their duly authorized representatives all books, papers, job cost records, detailed cost estimates, claims, and accounts, including payment, property, payroll, personnel, subcontractor records, and financial records related to or which arise out of the Work or under terms of this Contract. Contractor shall maintain such books, records, data and documents in accordance with generally accepted accounting principles and in accordance with these Contract Conditions and federal and state requirements. These books, papers, records, claims, and accounts shall be made available for examination during normal business hours and shall be readily available and accessible at Contractor's principal place of business in California, for audit during normal business hours at such place of business. Contractor shall provide office space, photocopies and other assistance to enable audit or inspection representatives to conduct such audits or inspections. This right to audit books and records directly related to this Contract shall also extend to any first-tier subcontractors employed under this Contract. Contractor shall incorporate this provision in any subcontract entered into as a result of this Contract and shall require its subcontractors to agree to cooperate with the above-listed agencies by making all appropriate and relevant Project records available to those agencies for audit and copying.

All of Contractor's books, papers, job cost records, detailed cost estimates, claims, and accounts, including payment, property, payroll, personnel, subcontractor records, and financial records related to or which arise out of the work or under terms of this Contract shall be retained for access, inspection and/or audit by the County, the State Auditor, or their duly authorized representatives for at least three (3) after County's final payment to Contractor and/or the final resolution of any claims under this Contract. Contractor shall incorporate this provision in any subcontract entered into as a result of this Contract.

## **2.3 RESPONSIBILITIES OF OWNER**

**2.3.1 Removal, Relocation, or Protection of Underground Infrastructure:** If the Contractor while performing the contract discovers utility facilities not identified by the Owner in the contract plans or specifications, Contractor shall immediately notify the Owner in writing. Owner shall have the sole discretion to perform the repairs or relocation work itself, or to permit the Contractor to do such repairs or relocation work at a reasonable price. In the event that the Owner authorizes the Contractor to perform the work, the parties shall proceed with a written Change Order as set forth in Article 5 herein. Compensation to the Contractor for said costs shall be in accordance with Section 4215 of the Government Code.

Nothing herein shall be construed to require the Owner to locate the presence of any existing services not expressly included in Government Code Section 4215, nor to limit the Owner's rights or remedies set forth therein.

In accordance with the provisions of Section 4215 of the California Government Code, Contractor shall not be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the Owner or owner of the utility to provide for the removal or relocation of such utility facilities.

## **Article 3**

### **CONTRACTOR'S RESPONSIBILITIES**

#### **3.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS**

**3.1.1 Reporting Errors in Contract Documents:** The Contractor shall carefully study and compare the Contract Documents with each other and shall at once report to the Inspector errors, inconsistencies, or omissions discovered. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency, or omission in the Contract Documents without such notice to the Owner, the Contractor shall assume responsibility for such performance and shall bear all costs for correction.

**3.1.2 Reporting Errors in Field Conditions:** The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Owner at once.

**3.1.3 No Implied Warranty:** No warranty is to be implied nor shall any warranty arise by operation of law, or by interpretation of this Contract, that the Plans and Contract Documents are adequate and sufficient to construct the Project.

#### **3.2 SUPERVISION AND CONSTRUCTION PROCEDURES**

**3.2.1 Supervision of Work:** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters.

**3.2.2 Acts of Employees and Agents:** The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.

**Acts Do Not Waive Contractor's Obligation:** The Contractor shall not be relieved of obligations to perform the Work in strict accordance with the Contract Documents either by activities or duties of the

Owner's Representative or the Inspector in the administration of the Contract, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

### **3.3 PROSECUTION OF WORK**

3.3.1 Time of the Essence: It is expressly understood and agreed that the time of beginning, rate of progress, and time of completion of the Work are of the essence. The contract calendar days shall begin on the date stated in the Notice to Proceed issued by the Owner.

Owner and Contractor recognize that time is of the essence of the Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified, plus any extensions thereof. They also recognize the delays, expense, and difficulties involved with proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner the sum of **Two Thousand dollars (\$2,000) per day**, as liquidated damages and not as a penalty, for each and every calendar day's delay in finishing the Work in excess of the contract time prescribed herein.

3.3.2 Work Hours: Work hours shall be 7:30 A.M. to 7:00 P.M. weekdays.

3.3.3 Order of Work: Portions of the sewer line must be constructed in specific order, the Contractor shall consider the following:

1. The existing sand-oil separator and vehicle wash system shall remain operational during construction.
2. Construction of sewer line A from Sta. 0+30± thru Sta. 2+00 shall be performed in a manner that disrupts sewer service the least amount possible.
3. Sewer line A shall be operational from Sta. 0+30± thru Sta. 2+70 before intercepting the existing 4" sewer line at Sta. 2+67.50 22' left.
4. Relocation of the existing sand-oil separator shall be the last order of construction to minimize the down time of a working equipment/vehicle wash facility.

The Contractor shall gain approval of construction sequence for sewer line A from the Contract Administrator prior to start of construction.

3.3.4 Construction Schedule: A critical path method (CPM) construction schedule is required to be submitted within five (5) days of issuance of Notice to Proceed. The CPM schedule will be for Owner's information only. Silence or inaction with regard to Contractor's schedule shall not be construed as acquiescence or acceptance of the schedule as being binding on Owner. Unless specifically adopted by resolution or minute order of the El Dorado County Board of Supervisors, such schedule shall not be binding on the County of El Dorado. Contractor's schedule shall provide for the completion date not to exceed the time limits for completion set forth in the Contract Documents. Float, whether for the entire Project or for specific tasks therein, shall be deemed to be for the benefit of the Owner. The Contractor shall keep the construction schedule current, and shall submit monthly updates to the Owner's Representative and Inspector, if any. The Contractor shall further prepare and keep current a schedule of submittals which is coordinated with the construction schedule, and which allows the Owner reasonable time to review the submittals.

### **3.4 SUBMITTALS**

3.4.1 Use of Listed Manufacturers; Review of "Or Equals": Contractor shall utilize only the manufacturer designated in its Proposal for major equipment items listed therein. In accordance with the provisions of Section 3400 of the California Public Contract Code, but subject to Subsection (b) thereof, Contractor shall within two (2) business days of the bid opening submit any substitution requests and shall submit data substantiating a request for a substitution of an "or equal" item. Failure to submit such substitution

requests and substantiating data within two (2) business days of the bid opening shall subject such request for substitution to automatic denial.

3.4.2 Excessive Submittal Reviews: The cost of reviewing submittals shall be the Owner's responsibility, except that Contractor shall be responsible for the cost of the third and subsequent review of any one submittal.

3.4.3 Submittal Process: Submittals shall be processed as described in these Contract Documents.

### **3.5 STATE AND FEDERAL LABOR REQUIREMENTS**

#### 3.5.1 3.5.1 Hours of Work:

1. Eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and it is expressly stipulated that no workman employed at any time by the Contractor, or by any subcontractor under this Contract, upon the Work, shall be required or permitted to work thereon more than eight (8) hours in any one (1) calendar day and/or more than forty (40) hours in any one (1) calendar week except as provided in Section 1815 of the Labor Code of California, and it is further expressly stipulated that for each and every violation of said last named stipulation, said Contractor shall forfeit, as penalty to the said Owner, \$25.00 for each workman employed in the execution of this Contract, or by any subcontractor under this Contract, for each calendar day during which said workman is required or permitted to labor more than eight (8) hours in any one (1) calendar day or more than forty (40) hours in any one (1) calendar week in violation of the provisions of said Labor Code.
2. In accordance with the provisions of the Labor Code of the State of California, the Contractor, and each subcontractor, shall also keep an accurate record showing the names and actual hours worked for all workers employed by him in connection with the Work contemplated by the Agreement, which record shall be open at all reasonable hours to the inspection of the Owner or its officers or agents, and to the Chief of the Division of Labor Statistics and Law Enforcement or the Department of Industrial Relations, his deputies or agents.

#### 3.5.2 Apprenticeship Employment:

1. Pursuant to the provisions of Section 1777.5 as amended, the Contractor or subcontractor employing tradesmen in any apprenticeable occupation shall apply to the joint apprenticeship committee nearest the site of the public works project and which administers the apprenticeship program in that trade for a Certificate of Approval. The certificate will also fix the ratio of apprentices to journeymen that will be used in the performance of the Contract. All requirements and exceptions to those requirements set forth herein for Apprenticeship Employment are contained in Labor Code Section 1777.5 and are available from the applicable Joint Apprenticeship Committee.
2. The Contractor shall make contributions to funds established for the administration of the apprenticeship programs if he employs registered apprentices or journeymen in any apprenticeable trade on such contracts and if other contractors on the public works site are making such contributions.
3. The Contractor and any subcontractor under him shall comply with the requirements of Sections 1777.5 and 1777.6 in the employment of apprentices. Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

### 3.5.3 Wage Rates:

1. Pursuant to Labor Code Section 1770 et seq., each laborer or mechanic of Contractor or any subcontractor engaged in work on the Project under this Contract shall be paid not less than the hourly wage rate of per diem wages set forth in the prevailing wage rate schedule published by the Director of Industrial Relations regardless of any contractual relationship which may be alleged to exist between Contractor or any subcontractor and such laborers and mechanics.
2. Any laborer or mechanic employed to perform work on the Project under this Contract, which work is not covered by any of the foregoing classifications, shall be paid not less than the prevailing rate of per diem wages specified herein for the classification which most nearly corresponds to the work to be performed by him.
3. The foregoing specified prevailing wage rates are minimum rates only, and the Contractor may pay any wage rate in excess of the applicable rate contained in this Contract.
4. Pursuant to Labor Code Section 1775, the Contractor as a penalty to the Owner shall forfeit \$50.00 for each calendar day, or portion thereof for each worker paid less than prevailing rate established by the Department of Industrial Relations for such work or craft in which such worker is employed. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which the worker was paid less than the prevailing wage rate shall be paid to each worker by the Contractor.
5. An error on the part of an awarding body does not relieve the Contractor from responsibility for payment of the prevailing rate of per diem wages and penalties pursuant to Labor Code Sections 1770 - 1775.
6. All Contractors and subcontractors are subject to the provisions of Sections 1810-1814 of the California Labor Code which provide that the maximum hours a worker is to be employed is limited to eight (8) hours a day and forty (40) hours a week and the Contractor or subcontractor shall forfeit, as a penalty, \$25.00 for each worker employed in the execution of the Contract for each calendar day during which a worker is required or permitted to labor more than eight (8) hours in any calendar day or more than forty (40) hours in any calendar week and is not paid overtime.
7. Section 1815 of the California Labor Code requires that notwithstanding the provisions of Sections 1810-1814, employees of Contractors who work in excess of eight (8) hours per day and forty (40) hours per week shall be compensated for all hours worked in excess of eight (8) hours per day at not less than 1-1/2 times the basic rate of pay.
8. In the case of federally funded projects, where federal and state prevailing wage requirements apply, compliance with both is required. This project is funded in whole or part by federal funds. Contractor's attention is directed to the requirements of, and compliance with the Copeland Act (18 U.S.C. 874 and 29 CFR Part 3), the Davis-Bacon Act (40 U.S.C. 276a to 276a-7 and 29 CFR Part 5), and the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330 and 29 CFR Part 5). (NOT APPLICABLE)
9. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, Contractor and subcontractors shall pay not less than the higher wage rate. The Department will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by Contractor and subcontractors, Contractor and subcontractors shall pay not less than the federal minimum wage rate which most closely approximates the duties of the employees in question. (NOT APPLICABLE)

10. Interested parties can obtain the current wage information by submitting requests to the Department of Industrial Relations, Division of Labor Statistics and Research, PO Box 420603, San Francisco CA 94142-0603, Telephone (415) 703-4708 or by referring to the website at <http://www.dir.ca.gov/dlsr/PWD>. The rates at the time of the bid advertisement date of a project will remain in effect for the life of the project in accordance with the California Code of Regulations, as modified and effective January 27, 1997.
11. Copies of the applicable state prevailing wage rates are on file with the El Dorado County Department of Transportation, at 2850 Fairlane Court, Placerville, California 95667, and they are available to any interested party on request.

**3.5.4 Certified Payroll:** As required under the provisions of Labor Code Section 1776 Contractor and subcontractors shall keep accurate payroll records:

1. The payroll records shall show 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 by him or her in connection with the Project.
2. A certified copy of all payroll records enumerated above shall be available for inspection at all reasonable hours at the principal office of the Contractor as follows:
  - a. Make available or furnish to the employee or his or her authorized representative on request.
  - b. Make available for inspection or furnished upon request to a representative of the Owner, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.
  - c. Make available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the Owner, the Division of Labor Standards Enforcement, or the Division of Apprenticeship Standards. The requesting party shall, prior to being provided the records, reimburse the costs of preparation by the Contractor, subcontractor, and the entity through which the request was made. The public shall not be given access to the records at the principal office of the Contractor.

**3.5.5 Discrimination In Employment:** No discrimination shall occur in the employment of persons upon the Work because of race, color, sex, national origin, or ancestry or religion of such persons.

**3.5.6 Convict-Made Materials:** Except as may be provided by law, the Contractor agrees that no materials manufactured or produced in a penal or correctional institution shall be incorporated in the construction under this Contract.

### **3.6 TAXES**

**3.6.1 Contractor Pays Taxes:** The Contractor and subcontractors shall pay all local, state, and federal taxes upon labor or materials involved in their branch of the Work, cost of same to be included in the Contract price.

### **3.7 COMPLIANCE WITH LAW AND LOCAL REQUIREMENTS**

**3.7.1 Regulations:** The Contractor and all subcontractors shall conform to and abide by all city, county, and state laws, ordinances, rules, and regulations, as the same pertain to the Work contemplated by said Plans and Contract Documents.

**3.7.2 Permits, Licenses, and Fees:** Other than the building permit the County shall procure and pay for all permits and inspection fees that may be required to commence, carry on, and complete the Contract. Contractor shall be responsible for all applicable license fees and procuring and paying for the building permit.



3.7.3 **Patent Rights, Copyrights, Trade Names, and Royalties:** The Contractor shall indemnify and save harmless the Owner and all persons acting under him for all liability on account of any patent rights, copyrights, or trade names which may affect the articles or materials or their application under the Contract Documents. The Contractor shall pay all royalties, or other charges that may arise, due to methods, types of construction, processes, materials or use of equipment, and shall hold the Owner harmless from any charges whatsoever which may arise, and shall furnish written assurance, satisfactory to the Owner, that such charges have been paid.

### **3.8 GUARANTEE**

3.8.1 **Final Guarantee:** The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year. Contractor warrants and guarantees for a period of one year from the date of the Notice of Acceptance that the Work is free from all defects due to faulty materials or workmanship and Contractor shall promptly make such corrections as may be necessary, including repairs of any damage to other parts of the Work resulting from such defects. Owner will give notice of observed defects with reasonable promptness. In the event that Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects within ten (10) calendar days after being notified in writing by Owner, Owner may do so and charge Contractor the cost thereby incurred.

3.8.2 **Extended Guarantees:** If a guaranty exceeding one year is provided by the supplier or manufacturer of any equipment used in this Project, then the guarantee for such materials shall be extended for such term. Contractor expressly agrees to act as co-guarantor of such equipment and materials, and Contractor shall supply Owner with all warranty and guaranty documents relative to equipment and materials incorporated in the job and guaranteed by their suppliers or manufacturers.

### **3.9 WARRANTY**

3.9.1 **Contract Warranty:** The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new, unless otherwise required or permitted by the Contract, that the Work will be free from defects or flaws and is of the highest quality of workmanship and that the Work will conform with the requirements of the Contract. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective.

### **3.10 INDEMNIFICATION**

3.10.1 **Owner Not Liable for Damages:** The Owner or its authorized representative shall not in any way or manner be answerable or suffer loss, damage, expense, or liability for any loss or damage that may happen to said Work, or part thereof, or in or about the same during its construction and before acceptance and the said Contractor shall assume all liabilities of every kind or nature arising from said Work, either by accident, negligence, theft, vandalism, or any cause whatever; and shall hold the Owner and its authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatever, other than for the active negligence of the Owner, its officers, agents and employees.

3.10.2 **Owner Not Liable for Debts:** Indebtedness incurred for any cause in connection with this Work must be paid by the Contractor, and the Owner is hereby relieved at all times from any indebtedness or claim other than the Contract price.

3.10.3 **Indemnity:** To the fullest extent allowed by law, Contractor shall defend, indemnify, and hold the County and its officers, directors, and employees, harmless against and from any and all claims, suits, losses, damages, and liability for damages, including attorney's fees and other costs of defense brought for or on account of injuries to or death of any person, including but not limited to, workers and the public, or on account of injuries to or death of County employees or damage to property, or any economic, consequential or special damages which are claimed or which shall in any way arise out of or be connected with Contractor's services, operations or performance hereunder, regardless of the existence or degree of fault or negligence on the part of the County, the Contractor, subcontractors or employees of any of these,

except for the active, or sole negligence of the County its officers and employees, or where expressly prescribed by statute.

The duty to indemnify and hold harmless the County specifically includes the duties to defend set forth in Section 2778 of the Civil Code. The insurance obligations of Contractor are separate, independent obligations under the Contract Documents, and the provisions of this defense and indemnity are not intended to modify nor should they be construed as modifying or in any way limiting the insurance obligations set forth in the Contract Documents.

**3.10.4 Environmental Indemnification:** To the fullest extent allowed by law, from and after recording of the Notice of Acceptance, Contractor shall indemnify, defend, and save harmless Owner from all losses or damages resulting from injury to or death of any person and damage to property, and any fine, which is occasioned by or arises out of any breach of Environmental and Toxics Warranty, representations, or covenants of Contractor under this Contract. Contractor further agrees to indemnify and hold harmless Owner, its officers, employees, and agents, from and against any and all liability as follows:

1. Including all foreseeable and all unforeseeable consequential damages, directly or indirectly arising out of the use, generation, storage, or disposal of hazardous materials in any location by Contractor, and
2. Including, without limitation, the cost of any required or necessary repair, cleanup, or detoxification and the preparation of any closure or other required plans, whether such action is required or necessary prior to or following filing of the Notice of Acceptance to the full extent that such action is attributable, directly or indirectly, to the presence or use, generation, storage, release, threatened release, or disposal of hazardous materials by any person on the Project prior to filing of the Notice of Acceptance. Contractor's obligations pursuant to the foregoing indemnity shall survive the filing of the Notice of Acceptance of the Project.
3. This agreement as to indemnity and reimbursement as above set forth to be undertaken by the Contractor shall survive the performance of the remainder of said Contract and shall remain in full force and effect notwithstanding such performance.
4. The foregoing duties of indemnity shall not apply to loss, damage, expense, or liability caused solely by the active negligence of the Owner or the Owner's agents, servants or independent contractors.

### **3.11 WORK REQUIREMENTS**

**3.11.1 Conduct of Work:** The Contractor shall confine the storage of his equipment and materials to limits as designated. He shall at all times exercise due caution and provide all necessary barricades and other safety equipment around the Work to protect the general public from injury to person and property during the entire time of performance of the Work. The Contractor shall not create excessive dust or noise.

**3.11.2 Maintenance of Site:** Strict prohibition against committing nuisances in or about the Work shall be maintained, and the Contractor shall not in any way obstruct or interfere with movements of traffic on any public right of way without first obtaining the necessary approval of the proper public agency.

**3.11.3 Clean Up of Site:** The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

**3.11.4 Cutting and Patching:**

1. The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

2. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

### **3.12 SUBCONTRACTORS**

3.12.1 Contractor Responsible for Subcontractor's Acts: Contractor shall be fully responsible to Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

3.12.2 Contractor's Subcontract: Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to Contractor by the terms of the Contract Documents insofar as applicable to the Work of subcontractors and to give Contractor the same power as regards terminating any subcontract that Owner may exercise over Contractor under any provisions of the Contract Documents. The percentage of retention withheld from any subcontractor by the Contractor shall not exceed the percentage of retention withheld from the Contractor as provided herein.

### **3.13 SUPERINTENDENT**

3.13.1 Work Superintendent: The Contractor will employ and maintain on the worksite a qualified supervisor or Superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the sites. The Superintendent shall have full authority to act on behalf of the Contractor, and all communications given to the Superintendent shall be as binding as if given to the Contractor. The Superintendent shall be present on the site at all times as required to perform adequate supervision and coordination of the Work.

### **3.14 LABOR AND MATERIALS**

3.14.1 Skilled Labor: All labor must be especially skilled for each kind of work, and must be thorough and first class in all respects. Any person whom the Inspector or Owner may deem incompetent or disorderly shall be promptly discharged from the Project and not re-employed.

3.14.2 Quality of Materials: All materials used on this Contract shall be new and the best market quality, unless specified or shown otherwise. All Work executed under this Contract shall be done in the best, most thorough, substantial and workmanlike manner and without flaws. All materials and labor shall be subject to the approval of the Inspector as to its quality and fitness, and shall be immediately removed if it does not meet with his approval. The Inspector may refuse to issue the Certificate for Payment until all defective materials or work have been removed and other material of proper quality substituted therefore. All removal and replacement with same shall be done at the Contractor's expense. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer.

## **Article 4**

### **ADMINISTRATION OF CONTRACT**

#### **4.1 ADMINISTRATION OF CONTRACT**

4.1.1 Contract Communications: Unless otherwise provided in the Contract or when direct communications have specifically been authorized, all parties shall communicate through the Owner's Representative or the Inspector if the Owner so directs. Communications by and with the subcontractors and material suppliers

shall be through the Contractor. Communications by Contractor to separate contractors, architect, or Project Manager shall be through the Owner's Representative.

**4.1.2** Control of Work: The Owner's Representative or the Inspector will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Owner's Representative or the Inspector will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Owner's Representative or the Inspector will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

**4.1.3** Recommendation for Payments: Based on his or her observations and evaluations of the Contractor's Applications for Payment, the Owner's Representative will review amounts due the Contractor and will recommend to Owner, payments to Contractor as set forth in the section entitled CERTIFICATION FOR PAYMENTS.

**4.1.4** Inspector's Authority: The Inspector will have the authority to stop work whenever necessary to ensure a proper execution of the Work. The Inspector will also have authority to reject Work which does not conform to the Contract Documents. Whenever the Inspector considers it necessary or advisable for implementation of the intent of the Contract Documents, the Inspector will have authority to require additional inspection or testing of the Work in accordance with the following section whether or not such Work is fabricated, installed, or completed. However, neither this authority of the Inspector nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Inspector to the Contractor, subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work. In the event an Inspector is not appointed by the Owner, the Owner's Representative shall have the authority set forth herein.

## **4.2 INSPECTION AND TESTING**

**4.2.1** Advance Notice: Contractor shall provide Owner's Representative seventy-two (72) hours notice prior to beginning work at a specific location and for a specific department. Contractor shall notify Owner's Representative and Inspector twenty four (24) hours prior to any day in which Contractor will 1) require an inspection of any portion of the Work, and 2) work in excess of eight (8) hours or any time Contractor intends to work weekends. Any work not performed subject to inspection will not be accepted and will be rejected and/ or ordered removed by Owner, or Inspector.

**4.2.2** Access to Work: The Owner's Representative, the Architect, the Project Manager, and the Inspector will at all times have access to the Work. In addition, authorized representatives and agents of any participating Federal or State Agency shall be permitted to inspect all Work, materials, payrolls, and records on personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection or testing thereof.

**4.2.3** Costs of Tests: The Owner shall bear all costs related to testing for conformance of the Work to the Contract requirements. However, if the Contractor has called for any testing, and that test fails, subsequent tests, and all related costs, shall be borne by the Contractor.

**4.2.4** Preparation of Change Directives/Orders: The Owner's Representative or the Inspector, if one is appointed, will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in the section entitled CHANGES IN WORK.

## **4.3 CLAIMS**

**4.3.1** Concealed or Unforeseen Conditions: It is understood by both parties that Contractor has made a pre-contract investigation of the site. All concealed, unforeseen, or materially differing conditions are the

responsibility of the Contractor in the absence of an actual material, intentional misrepresentation by the Owner as to the conditions on the site. Contractor shall give written notice of any conditions encountered at the site which are unforeseen, concealed, or materially different from those set forth in the Plans or Contract Documents, or ordinarily encountered and generally recognized as inherent in the Work. Such written notice shall be given within five (5) days of his discovery of any such facts.

4.3.2 Notice of Discovery of Hazardous Waste or Unusual Conditions:

1. The Contractor shall promptly, and before the following conditions are disturbed, notify the Owner in writing, in the event the Contractor encounters any of the following:
  - a. Material that the Contractor believes may be hazardous waste, as defined in section 25117 of the Health and Safety Code that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.
  - b. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the contract.
2. The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work shall issue a change order under the procedures described herein.
3. In the event a dispute arises between the Owner and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for in the contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the Contractor and the Owner.

4.3.3 Time Limits on Claims: Claims by Contractor must be made within ten (10) calendar-days after occurrence of the event giving rise to such Claim, except that claims made due to delay or hindrances which Contractor claims was caused by Owner shall be made within five (5) calendar-days after occurrence of the event giving rise to such Claim. Claims must be made by written notice. Failure to make such claim in writing in the time set forth herein shall bar Contractor from recourse for such claim. All claims must be filed on or before the payment date of Final Payment.

4.3.4 Claims for Additional Costs:

1. If Contractor wishes to make a Claim for an increase in the Contract Price, he shall give the Owner written notice thereof within the time set forth in Paragraph 4.3.3. This notice shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property in which case the Contractor shall, as soon as possible, advise Owner of his intent to do the Work.
2. Increases in Contract Price due to Claims shall be calculated based on the Cost Reimbursement method detailed in Paragraph 5.4.1.3.
3. Under no circumstances shall Contractor recover any administrative overhead costs or recover on the basis of any "Home Office" damages formula, "Total Cost" recovery formula, or any other such formula.

4.3.5 Claims for Additional Time:

1. If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate probable effect of delay on progress of the Work and shall be substantiated by Contractor's submittal of a Time Impact Analysis (TIA). The TIA shall be shown on the CPM schedule and in a narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.
2. If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.
3. The Owner shall not be liable for any damages on account of any reasonable delay or hindrance of the Owner. However, Contractor shall be entitled to an extension of time for any delay or hindrance caused by the Owner. Any delay or hindrance by Owner which is unreasonable and not within the contemplation of the parties may subject Owner to a claim for damages. Contractor shall make any claims in writing within the time set forth in Paragraph 4.3.3., for any unreasonable delay or hindrance caused by Owner, and specifying the cause thereof as required in paragraph "Submittal of Claims."

4.3.6 Submittal of Claims: Any disputes relating to this Contract, or its breach, which is not disposed of by agreement shall be promptly submitted as a claim to the Owner's Representative who shall issue a written response on the dispute. Claims shall be submitted by the Contractor to the Owner's Representative with adequate supporting data and include a demand for the Owner's Representative's decision. Adequate supporting data shall include, but is not limited to, a statement of the reasons for the asserted entitlement, the certified payroll, invoice for material and equipment rental, and an itemized breakdown of any adjustment sought.

4.3.7 Submission Under Penalty of Perjury: The Contractor shall certify, at the time of submission of a claim, as follows:

"I certify under penalty of perjury under the laws of the State of California, that the claim is made in good faith, that the supporting data are accurate and complete, and that the amount requested accurately reflects the contract adjustment for which the Owner is liable."

By: \_\_\_\_\_  
“(Contractor's signature)”

**4.4 DISPUTES RESOLUTION**

4.4.1 Continue Work During Dispute: In the event of any dispute between the Owner and the Contractor, the Contractor will not stop Work but will prosecute the work diligently to completion in the manner directed by the Owner, and the dispute shall be resolved as set forth herein after completion of the Work. However, all disputes must be submitted by Contractor in accordance with the subsequent provisions of this section.

4.4.2 Requirements for Filing a Claim: For any claim subject to this Article, the following requirements apply: the claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by this contract for the filing of claims.

1. For claims of less than fifty thousand dollars (\$50,000.00), the Owner shall respond in writing to any written claim within forty five (45) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the claims or relating to defenses or claims the Owner may have against the Contractor, any additional documentation supporting the claim or relating to defenses to the claim the Owner may have against the Contractor.

If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the Owner and the Contractor.

The Owner's written response to the claim, as further documented, shall be submitted to the Contractor within fifteen (15) days after receipt of the further documentation or within a period of time not greater than that taken by the Contractor in producing the additional information, whichever is greater.

2. For claims of over fifty thousand dollars (\$50,000.00) and less than or equal to three hundred seventy-five thousand dollars (\$375,000.00), the Owner shall respond in writing to all written claims within sixty (60) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the claim, any additional documentation supporting the claim or relating to the defenses or claims the Owner may have against the Contractor.

If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the Owner and the Contractor.

The Owner's written response to the claim, as further documented, shall be submitted to the Contractor within thirty (30) days of receipt of the further documentation, or a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater.

3. If the Contractor disputes the Owner's written response, or the Owner fails to respond within the time prescribed, the Contractor may so notify the Owner, in writing, either within fifteen (15) days of receipt of the Owner's written response or within fifteen (15) days of Owner's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the Owner shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.
4. If following the meet and confer conference the claim or any portion remains in dispute, the Contractor may file a claim pursuant to 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 Government Code, and in accordance with Section 20104.2 of the Public Contract Code.

4.4.3 Owner's Review of Claim: The Owner's Representative shall review the facts pertinent to the claim, secure assistance from legal and other advisors, coordinate with the contract administrators, and promptly provide a written response. The response shall be furnished to the Contractor by certified mail, return receipt requested, or any other method that provides evidence of receipt. The Owner's Representatives' response shall be final and conclusive except as is otherwise provided herein.

4.4.4 Claims Exempt from Review: The procedures and remedies provided in this Section 4.4 do not apply to:

1. Any claims by the Owner.
2. Any claim for or respecting personal injury or death or reimbursement or other compensation arising out of or resulting from liability for personal injury or death.
3. Any claim or dispute relating to stop payment requests or stop notices.

4. Any claim related to the approval, refusal to approve, or substitution of subcontractors, regardless of tier, and suppliers.

4.4.5 Suit in El Dorado County Only: Any litigation arising out of this Contract shall be brought in El Dorado County. The Owner and the Contractor shall follow procedures established for all civil actions filed to resolve claims pursuant to Public Contract Code section 20104 et seq., including but not limited to section 20104.4.

4.4.6 Payment of Undisputed Portion of Claim: Payment by Owner of undisputed portion of claim; interest on arbitration award or judgment.

1. Owner shall pay Contractor such portion of a claim which is undisputed except as otherwise provided in the contract.
2. In any suit filed pursuant to Public Contract Code section 20104.4, the provisions of section 20104.6 shall apply.
3. The rate of interest payable on unpaid and undisputed claims shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Owner information in sufficient detail to enable the Owner to accept the claim statement.
4. The rate of interest payable on any judgment or award in arbitration shall not exceed 6% per annum in accordance with Civil Code Section 3287 et seq.

## **Article 5**

### **CHANGES IN WORK**

#### **5.1 WAIVER**

5.1.1 Waivers of Contract Provisions: It is expressly understood and agreed that no waiver granted by the Inspector or the Owner of any term, provision, or covenant of this Contract shall constitute a precedent for breach of the same or any other terms, provisions, or covenants of this Contract.

#### **5.2 CHANGES**

5.2.1 Owner May Order Changes in Work: The Contractor agrees that the Owner, without invalidating the Contract, may order changes in Work by altering, adding to, or deducting from the Work, the Contract Amount and Time being adjusted according to the provisions of Section 5.4 and Section 5.5. Contractor agrees to enter into a modification of his original Contract for such changes.

5.2.2 Cost Proposals: Upon request of the Owner for a quotation on the change to the Work, the Contractor shall promptly submit to Owner's Representative, and the Inspector, if one is appointed, in writing a detailed breakdown of the work and of the amount of deduction or addition claimed. In no case shall Cost Proposals be provided later than ten (10) calendar days from the date requested. The Owner's request for quotations on alterations to the Work shall not be considered authorization to proceed with the work prior to issuance of a Change Order, nor shall such request justify any delay in existing work. If Contractor fails to provide Cost Proposals within ten (10) calendar days, Owner may prepare the Cost Proposal based on estimates of labor, materials, and equipment. This proposal, prepared by Owner, shall be binding on the Contractor, will become the basis for Contract Price adjustment, and shall not be subject to dispute or claim.

5.2.3 Contract Change Instrument: Changes in work involving a change in Contract Price or Contract Time shall be done only pursuant to an Architect's Supplemental Instructions, Change Order, or Construction Change Directive as set forth below in this article.



5.2.4 **Changes Shall Conform to Contract:** Changes in work shall be performed in conformance with applicable provisions of the Contract Documents, and the Contractor shall proceed promptly unless otherwise provided in the Architect's Supplemental Instructions, Change Order, or Change Directive.

### **5.3 CONTRACT CHANGE INSTRUMENTS**

5.3.1 **Architect's Supplemental Instructions (ASI):** The Owner's Representative or the Architect may order minor changes in work by use of an Architect's Supplemental Instruction. These minor changes will involve neither changes in the Contract Price or Contract Time. If the Contractor disagrees that the change does not involve a change in cost or time, then a Change Order or Change Directive shall be used.

5.3.2 **Change Order (CO):** The Change Order shall be used in cases where Owner and Contractor agree on the change in work, the amount of or method of computing the Contract Amount, and the amount of adjustment in Contract Time.

5.3.3 **Construction Change Directive (CCD):** In the event that the Owner and Contractor do not agree on the proposed change in work, and/or the proposed adjustment of Contract Price and Time, or in the event it is essential that the Contractor proceed expeditiously and without delay, then Owner may, by issuance of a Construction Change Directive, order changes in work, and the Contractor shall promptly proceed with the change in work involved.

1. **Acceptance of Change Directive:** If Contractor agrees with the Change Directive, the Contractor shall by his signature thereon, indicate his acceptance of the terms of the Directive, including adjustments to price and time, and the Change Directive shall then be followed by a Change Order.
2. **Non-Acceptance of Change Directive:** If the Contractor disagrees with the method of computing an increase in Contract Price, then the amount of adjustment shall be computed by the Cost Reimbursement method detailed in Basis for Adjustment. Disagreements with amounts or credits, under the Cost Reimbursement method, or time, shall be considered a dispute, and processed under the section on Disputes Resolution.

### **5.4 BASIS OF ADJUSTMENT**

5.4.1 **Methods of Adjustment:** The amount of adjustments to Contract Price, whether a credit or payment, shall be computed by one of the methods detailed below. The method used shall be at the sole determination of the Owner.

1. **Unit Prices:** Those prices stipulated in the Bid Proposal shall be utilized where they are applicable. In the event the change in original quantity is in excess of twenty five (25) percent of the original bid quantity, and the total dollar value of that bid is greater than \$5,000, the Owner shall review the unit price to determine if a new unit price shall be renegotiated. Unit prices for new items shall be negotiated and mutually agreed upon.
2. **Lump Sum:** A total lump sum for the Work negotiated and mutually acceptable to the Contractor and Owner. Lump sum quotations for modifications to the Work shall include substantiating documentation with an itemized breakdown of Contractor's and subcontractor's costs, including labor, materials, rentals, approved services, overhead, and profit all calculated as specified in the Cost Reimbursement method which follows.
3. **Cost Reimbursement (Extra Work):** In this method, the payment for Extra Work shall be made on a time and expense basis that is on an accounting of the Contractor's forces, materials, equipment, and other items of cost as required and used to do the Work. Payment will be made for the documented actual cost of the following:

- a. Costs of direct labor, excluding supervisory personnel, including social security, old age and unemployment insurance, fringe benefits required by agreement, labor insurance and labor taxes established by law.
- b. Costs of materials, supplies, and equipment, including cost of transportation and sales tax, whether incorporated if paid for by the Contractor or his subcontractor.
- c. Rental costs, prevailing in the area, of machinery and equipment for the actual time used, and including transportation costs for items having value in excess of \$100.00.
- d. Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work.

To the above cost the Contractor shall be allowed a markup of twenty (20) percent on direct labor charges and fifteen (15) percent for all other cost items. When any or all of the Extra Work is done by one of the Contractor's subcontractors, the markups set forth above shall be applied to the subcontractor's actual costs to which a five (5) percent markup shall be allowed the Contractor. These markups shall be considered to be full compensation, covering the cost of general supervision, administration, overhead, profit, and any and all other general expenses, including, but not limited to, uniforms, hand tools, safety equipment, travel and lodging.

## **5.5 EXTENSION OF TIME FOR COMPLETION**

5.5.1 Contractor Delayed or Hindered: Should the Contractor be delayed or hindered in the completion of the Work by the neglect of the Owner, or by fire, by strikes, lockouts, embargoes or earthquakes, and any other causes the Inspector approves as not having been reasonably foreseeable at the time of execution of the Contract Documents, then the time allowance herein fixed for the completion of the Work shall be extended for a period equivalent to the time lost by reason of any or all of the causes aforesaid. Time extensions must be requested in accordance with Section 4.3.

5.5.2 Agreement on Time Extension: In addition, the Contractor and the Owner reserve the right to mutually agree in writing upon an extension of time for completion for causes other than enumerated above.

5.5.3 Time Extension Not Waiver: The granting of an extension of time by the Owner for performance by the Contractor shall not operate as a waiver or stop the Owner from claiming damages due to any other delays, prior or subsequent, which were not approved by the Owner as provided herein.

## **Article 6**

### **PAYMENTS AND COMPLETION**

#### **6.1 GENERAL**

6.1.1 Contract Price: The Contract Price is stated in the Contract is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

6.1.2 Waiver: Neither the acceptance of the Work by the Owner nor the payment of any part or all of the sum due the Contractor hereunder shall constitute a waiver by the Owner of any claim which the Owner may have against the Contractor or Surety under this Contract or otherwise.

6.1.3 Manner of Paying Warrants: Payment becomes due under the terms of this Contract in the manner prescribed by law. The Auditor shall cause a warrant for the Certified amount to be drawn upon the proper fund of the Treasurer of the Owner, which warrant shall be approved and issued to Contractor

within that period of time customarily required to process said warrants in the ordinary course of Owner's business.

## **6.2 APPLICATIONS FOR PAYMENT**

6.1.4 Submittal of Applications: Every thirty (30) days, the Contractor shall submit to the Owner's Representative an itemized Application for Payment for work completed to date. Such application shall be supported by such data substantiating the Contractor's right to payment as the Owner may require, such as copies of requisitions from subcontractors and material suppliers.

6.1.5 Schedule of Values: Before the first Application for Payment, the Contractor shall submit to the Owner's Representative a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Owner may require. This schedule, upon approval by the Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. In applying for payments, the Contractor shall submit a statement based on this schedule. Payment will be made only for material and work actually incorporated in the work. A suggested Monthly Payment Form for this progress payment can be found at the end of these Conditions of the Contract.

6.1.6 Basis for Payment: Each Application for Payment shall be based upon the Schedule of Values submitted pursuant to section 6.2.2. Applications shall indicate the percentage of completion of each major category of the Work as identified in the Schedule of Values as of the end of the month covered by the Application.

6.1.7 Work Free of Liens: The Contractor warrants that upon submittal of an Application for Payment, all work for which Certificates for Payment have been previously issued and payments received from the Owner shall be free and clear of liens, claims, security interests, or encumbrances against Contractor by subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment in relation to the Work.

## **6.3 CERTIFICATION FOR PAYMENT**

6.1.8 Certification Determination: The Owner's Representative will, within seven (7) days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certification for Payment, with a copy to the Contractor, for such amount as determined to be properly due, or notify the Contractor of the reasons for withholding certification in whole or in part as provided in section 6.4.1.

6.1.9 The Owner shall pay or cause to be paid to Contractor, an amount equal to ninety five percent (95%) as noted in section 6.4.3 of the amount set forth in the approved Certificate for Payment within thirty (30) days of receipt of an Application for Payment approved by the Owner's representative as provided for in Paragraph 6.3.1 above, and shall retain the remaining five percent (5%) as noted in 6.4.3 until the time provided for in section 6.6.4. The Owner shall withhold amounts pursuant to stop notices received in addition to the retention. Failure of Owner to make payments provided herein in a timely manner shall not constitute a default by the Owner of the Contract, but may entitle the Contractor to interest as provided by law.

## **6.4 WITHHOLDING FROM PAYMENTS**

6.1.10 Reasons for Withholding: The Owner, upon recommendation of the Inspector, may withhold payments, or on account of subsequently discovered evidence nullify the whole or a part of any progress or retention payments to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective work or material not remedied or replaced.
2. The filing of claims or Stop Notices to withhold, or reasonable evidence indicating probable filing of such claims or notices.

3. Failure of the Contractor to make payments properly to subcontractors, or for materials or labor.
4. Failure to make payments to any person or entity for financial obligations of the Contractor under terms of this Contract.
5. A reasonable doubt that the Contract can be completed for the balance then unpaid.
6. Damage to another contractor.
7. Performance of work in violation of the terms of the Contract Documents.
8. Excessive costs to Owner.
9. Failure of Contractor to comply with requirements for timely submittal of specified documentation, including but not limited to construction schedules, cost proposals, and submittals.

**6.1.11** Release of Payment: When the above grounds for withholding are removed, payment shall be made for amounts withheld because of them.

**6.1.12** Method of Retainage: The Department will retain 5% of the value of each progress payment from each progress payment. The retained funds shall be retained until thirty five (35) days after recordation of the applicable Notice of Acceptance.

## **6.5 SUBSTITUTE SECURITIES FOR RETENTION**

**6.1.13** Substitution of Securities: Bidders are hereby put on notice that the successful bidder may substitute securities for any monies withheld by the County of El Dorado to insure performance of the Contract pursuant to Public Contract Section 22300. This section provides that the Contractor may elect to receive 100 percent of payments due under the Contract Documents from time to time, without retention from any portion of the payment by the County of El Dorado, by depositing eligible securities of equivalent value with the County of El Dorado or qualified escrow agent in accordance with the provisions of Public Contract Code Section 22300. Eligible securities shall be limited to those listed in Section 16430 of the Government Code, or bank or savings and loan certificates of deposit from a qualified institution. Any such escrow agreement shall follow the form set forth in Public Contract Code Section 22300(f) and provided by the Owner.

## **6.6 FINAL COMPLETION AND PAYMENT OF RETAINAGE**

**6.1.14** Affidavit of Payment: After the date of Substantial Completion of the Work, and before final acceptance of the Work, the Contractor shall file with the Owner his affidavit, sworn to before a Notary Public, stating that all workmen and persons employed, all firms supplying materials, and all subcontractors upon the project for either labor or material have been paid in full, except certain items, if any, to be set forth in such affidavit covering disputed claims, including claims for acceleration, disruption, delays, inefficiencies, and hindrance, or items in connection with which Stop Notices have been filed under the provisions of the Statutes of the State of California. The filing of such affidavit by the Contractor shall be one of the prerequisites to the making, by the Owner, of the final retainage payment on the Contract.

**6.1.15** 6.6.2 Final Inspection: Upon receipt of written notice that the Work portions as described in 6.2.2 are ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner will promptly make such inspection. The Contractor shall complete all punch list items within two days of receipt of the written punch list. When the Owner's Representative finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner's Representative will promptly recommend to Owner that Owner may consider the Project complete, that the Board of Supervisors may accept the project and that the Notice of Acceptance may be recorded.

- 6.1.16 **6.6.3 Final Certification:** Before issuance of final payment, Contractor shall file, with Owner, a certificate in which he certifies that to the best of the Contractor's knowledge, information, and belief, and on the basis of observations and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents.
- 6.1.17 **6.6.4 Payment of Retention:** Thirty-five (35) days after the applicable Notice of Acceptance has been filed, provided the Work is fully completed and the Contract fully performed, the balance due under the Contract shall be paid, less any monies held for stop notices. These payments shall not be construed as an absolute acceptance of the work done up to the time of such payments. The Contractor, if requested by the Owner, shall furnish receipts or other vouchers showing his payments for materials and labor. Owner may withhold from final payment an amount not to exceed 150 percent of any amount in dispute.
- 6.1.18 **6.6.5 Notice of Acceptance:** The Work shall be accepted in writing in the form of a Notice of Acceptance when the whole of the work has been completed satisfactorily to the Owner. In judging the Work, no allowance for deviations from the original Contract Documents will be made unless already approved in writing at the proper times and in the manner as called for herein.

## Article 7

### PROTECTION OF PERSONS AND PROPERTY

#### 7.1 PROTECTION OF WORK, PROPERTY, AND PERSONS

- 7.1.1 **Responsible for Damage to Owner's Property:** The Contractor shall be entirely responsible for any damage to the property of the Owner due to careless handling of tools and/or materials or other causes attributed to the Contractor's Work in performing this Contract.
- 7.1.2 **Responsible for Safety:** The Contractor will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury, or loss to all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- 7.1.3 **Safety and Convenience:** The Contractor will comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction. The Contractor will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. The Contractor will notify owners of adjacent utilities when prosecution of the Work may affect them.
- 7.1.4 **Remedy Damages:** The Contractor will remedy all damage, injury, or loss to any property caused, directly or indirectly, in whole or part, by the Contractor, any subcontractor, or anyone directly or indirectly employed by any of them or anyone of whose acts any of them would be liable, except damage or loss attributable to the sole or active negligence of the Owner or the Inspector or anyone employed by them and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.
- 7.1.5 **Protection of Workers in Trenches:** See 31 23 43 of the Technical Specifications.
- 7.1.6 **Archaeological Discoveries:** If subsurface archaeological or historical materials remains (including, but not limited to, unusual amounts of bones, stones or shells) are discovered during excavation or construction at the site, Contractor shall protect and leave undisturbed and in place archaeological materials in accordance with the following codes and these conditions of the contract:
1. California Public Resources Code, Division 5, Chapter 1.7 § 5097.5
  2. California Public Resources Code, Division 5, Chapter 1.75 § 5097.98 and § 5097.99
  3. California Administrative Code, Title 14 § 4308

4. California Penal Code, Part 1, Title 14 § 622-1/2
5. California Health and Safety Code, Division 7, Part 1, Chapter 2, § 7050.5

Archaeological materials are the physical remains of past human activity and include historic-period archaeological materials and prehistoric Native American archaeological materials. Nonhuman fossils are not considered to be archaeological except when showing direct evidence of human use or alteration or when found in direct physical association with archaeological materials as described in these conditions of the contract.

Historic-period archaeological materials include cultural remains beginning with initial European contact in California, but at least 50 years old. Historical archaeological materials include:

1. Trash deposits or clearly defined disposal pits containing tin cans, bottles, ceramic dishes, or other refuse indicating previous occupation or use of the site
2. Structural remains of stone, brick, concrete, wood, or other building material found above or below ground or
3. Human skeletal remains from the historic period, with or without coffins or caskets, including any associated grave goods

Prehistoric Native American archaeological materials include:

1. Human skeletal remains or associated burial goods such as beads or ornaments
2. Evidence of tool making or hunting such as arrowheads and associated chipping debris of fine-grained materials such as obsidian, chert, or basalt
3. Evidence of plant processing such as pestles, grinding slabs, or stone bowls
4. Evidence of habitation such as cooking pits, stone hearths, packed or burnt earth floors or
5. Remains from food processing such as concentrations of discarded or burnt animal bone, shellfish remains, or burnt rocks used in cooking

Immediately upon discovery of archaeological materials, stop all work within a 100-foot radius of the archaeological materials and immediately notify the Owner's Representative. Archaeological materials found during construction are the property of the State. The Owner's Representative will make arrangements for a qualified archaeologist and a representative from the Native American Heritage Commission to determine the significance of the find and develop a plan with specific measures to protect the find in a manner commensurate with the significance of the find. The plan shall be implemented before construction continues within 100 feet of the discovery. If, in the opinion of the Owner's Representative, completion of the work is delayed or interfered with by reason of an archaeological find or investigation or recovery of archaeological materials, the Contractor will be compensated for resulting losses and an extension of time will be granted in the same manner as provided for in accordance with Section 5.5.

The Owner may use other forces to investigate and recover archaeological materials from the location of the find. When ordered by the Owner's Representative Contractor shall furnish labor, material, tools and equipment, to secure the location of the find, and assist in the investigation or recovery of archaeological materials and the cost will be paid for as Cost Reimbursement (extra work) as provided in Section 5.4.

## **Article 8**

### **INSURANCE AND BONDS**

#### **8.1 INSURANCE**

##### **GENERAL INSURANCE REQUIREMENTS**

The Contractor shall provide proof of a policy of insurance satisfactory to the El Dorado County Risk Management Division and documentation evidencing that the Contractor maintains insurance that meets the following requirements:

1. Full Workers' Compensation and Employers' Liability Insurance covering all employees of the Contractor as required by law in the State of California.
2. Commercial General Liability Insurance of not less than Two Million Dollars (\$2,000,000) combined single limit per occurrence for bodily injury and property damage, including but not limited to endorsements for the following coverage: Premises, personal injury, operations, products and completed operations, blanket contractual, and independent contractors liability. This insurance can consist of a minimum \$1 Million primary layer of CGL and the balance as an excess/umbrella layer, but only if the County is provided with written confirmation that the excess/umbrella layer "follows the form" of the CGL policy.
3. Automobile Liability Insurance of not less than One Million Dollars (\$1,000,000) is required in the event motor vehicles are used by the Contractor in performance of the contract.
4. In the event Contractor is a licensed professional and is performing professional services under this contract, Professional Liability Insurance is required with a limit of liability of not less than One Million Dollars (\$1,000,000).
5. Explosion, Collapse and Underground coverage is required when the scope of work includes XCU exposures. For the purpose of this contract, XCU coverage is required.

##### **PROOF OF INSURANCE REQUIREMENTS**

1. Contractor shall furnish proof of coverage satisfactory to the El Dorado County Risk Management Division as evidence that the insurance required herein is being maintained. The insurance will be issued by an insurance company acceptable to the Risk Management Division, or be provided through partial or total self-insurance likewise acceptable to the Risk Management Division.
2. The County of El Dorado, its officers, officials, employees, and volunteers shall be included as additional insureds, but only insofar as the operations under this Contract are concerned. This provision shall apply to all general liability and excess liability policies. Proof that the County is named additional insured shall be made by providing the Risk Management Division with a certified copy, or other acceptable evidence, of an endorsement to Contractor's insurance policy naming the County additional insured.
3. In the event Contractor cannot provide an occurrence policy, Contractor shall provide insurance covering claims made as a result of performance of this contract for not less than three (3) years following completion of performance of this Contract.
4. Any deductibles or self-insured retentions must be declared to and approved by the County. At the option of the County, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the County, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

5. Contractor shall require each of its subcontractors to procure and maintain commercial general liability insurance, automobile liability insurance, and workers compensation insurance of the types and in the amounts specified above, or shall insure the activities of its subcontractors in its own policy in like amounts. Contractor shall also require each of its subcontractors to name Contractor and County of El Dorado as additional insureds.

#### **INSURANCE NOTIFICATION REQUIREMENTS**

1. Contractor agrees no cancellation or material change in any policy shall become effective except upon prior written notice to the County of El Dorado Contract Services Unit, Janel Gifford at the office of the Department of Transportation, 2850 Fairlane Court, Placerville.
2. Contractor agrees that the insurance required herein shall be in effect at all times during the term of this agreement. In the event said insurance coverage expires at any time or times during the term of this Contract, Contractor shall immediately provide a new certificate of insurance as evidence of the required insurance coverage. In the event Contractor fails to keep in effect at all times insurance coverage as herein provided, County may, in addition to any other remedies it may have, terminate this Contract upon the occurrence of such event. New certificates of insurance are subject to the approval of the Risk Management Division.

#### **ADDITIONAL STANDARDS**

Certificates shall meet such additional standards as may be determined by the Department either independently or in consultation with the Risk Management Division, as essential for protection of the County.

#### **COMMENCEMENT OF PERFORMANCE**

Contractor shall not commence performance of this Contract unless and until compliance with each and every requirement of the insurance provisions is achieved.

#### **MATERIAL BREACH**

Failure of Contractor to maintain the insurance required herein, or to comply with any of the requirements of the insurance provisions, shall constitute a material breach of the entire Contract.

#### **REPORTING PROVISIONS**

Any failure to comply with the reporting provisions of the policies shall not affect coverage provided to the County, its officers, officials, employees or volunteers.

#### **PRIMARY COVERAGE**

The Contractor's insurance coverage shall be primary insurance as respects the County, its officers, officials, employees and volunteers. Any insurance or self-insurance maintained by the County, its officers, officials, employees or volunteers shall be in excess of the Contractor's insurance and shall not contribute with it.

#### **PREMIUM PAYMENTS**

The insurance companies shall have no recourse against the County of El Dorado its officers, agents, employees, or any of them for payment of any premiums or assessments under any policy issued by any insurance company.

#### **CONTRACTOR'S OBLIGATIONS**

Contractor's indemnity and other obligations shall not be limited by the insurance required herein and shall survive the expiration of this Contract.

## **8.2 BONDS**

- 8.2.1 General Requirements for Bonds: Before commencing any Work under the Contract, the Contractor shall file two of each bond with the Owner. These bonds shall be in the amounts and for the purposes specified below. They shall be Surety bonds and shall be issued by corporations duly and legally licensed and qualified to transact business in the State of California. They shall be maintained by him and at his expense during the entire life of the Contract or later as provided.



- 8.2.2 **Performance Bond:** One bond shall be in the amount of 100 percent of the Awarded Contract including selected Bid Additives, and shall guarantee the faithful performance of the Contract and shall insure the Owner during the life of the Contract and the Guarantee period. The Contractor may provide, subject to approval by the Owner, a separate guarantee bond upon completion of and acceptance of the work.
- 8.2.3 **Payment Bond:** One bond shall be in the amount of 100 percent of the Awarded Contract including selected Bid Additives, and shall guarantee the payment in full of all claims for labor and materials in accordance with the provisions of the laws of the State of California.
- 8.2.4 **Change of Surety:** If, at any time a Surety on such bonds becomes irresponsible or loses its right to do business in the State of California, the Owner may require another Surety which the Contractor shall furnish within ten (10) calendar days after receipt of written notice to do so.
- 8.2.5 **Authentication of Bonds:** Evidence of authority of an attorney-in-fact acting for the corporate Surety must be provided in the form of a certificate as to his power of attorney and to the effect that it is not terminated and remains in full force and effect on the date of the bonds. The form of the bonds shall be in accordance with those provided in the Draft Agreement.

## **Article 9**

### **UNCOVERING AND CORRECTION OF WORK**

#### **9.1 DEVIATION FROM CONTRACT DOCUMENTS**

- 9.1.1 **Improper Work:** If the Contractor shall vary from the Contract Documents in the form or quality of the Work, or the amount or value of the materials herein provided for, the Owner shall have the right to order such improper work or materials removed, remade, or replaced. In the event that the Work is ordered changed, any other work disturbed or damaged by such alteration shall be made good at the Contractor's expense.

#### **9.2 CORRECTION OF WORK**

- 9.2.1 **Covered or Completed Work:** If any work is covered contrary to the written instructions of the Owner's Representative, or the Inspector, if one is appointed, it must, if requested, be uncovered for observation and replaced at the Contractor's expense.
- 9.2.2 **Inspection of Covered Work:** If the Owner's Representative or the Inspector, if one is appointed, considers it necessary or advisable that covered Work be inspected or tested by others, the Contractor, upon request, will uncover, expose, or otherwise make available for observation, inspection, or testing as the Inspector may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction; if, however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and construction, and an appropriate Change Order shall be issued.
- 9.2.3 **Rejected Work:** The Contractor shall promptly remove from the premises all Work rejected by Owner for failure to comply with the Contract Documents, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the work either during the term of the Contract or during the warranty period, in accordance with the Contract Documents and without expense to the Owner and shall bear the expense of making good all Work of other contractors destroyed or damaged by such removal or replacement.

9.2.4 Cost of Correction: All removal and replacement Work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected Work within ten (10) days after receipt of written notice, the Owner may remove such Work and store the materials at the expense of the Contractor. Owner also may perform such Work or repairs itself and charge the expense to the Contractor.

## **Article 10**

### **SUSPENSION OF CONTRACT**

#### **10.1 SUSPENSION OF WORK**

10.1.1 Owner May Suspend: The Owner may suspend the Work or any portion thereof for a period of not more than ninety (90) days or such further time as agreed upon by the Contractor, by written notice to the Contractor and the Inspector which shall fix the date on which work shall be resumed.

10.1.2 Resumption of Work: The Contractor shall resume that Work on the dates so fixed. The Contractor shall be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributed to any suspension.

**“END OF DOCUMENT”**

**MONTHLY STATEMENT FORM**

NAME OF CONTRACT \_\_\_\_\_

CONTRACTOR \_\_\_\_\_

Statement as of \_\_\_\_\_

Item No.	Description*	Schedule of Value Amount	Percent Complete This Period	Amount Due	Total Percent Complete	Total Amount Paid
TOTAL CONTRACT PRICE						
Change Order No. _____						
REVISED CONTRACT PRICE						
Total earned to date						
Less 5% Retention						
Total amount due						
Less previous payments						
AMOUNT DUE THIS PAYMENT						

Submitted by:

Approved by:

\_\_\_\_\_

\_\_\_\_\_

\*List Schedule of Value item which comprise the total of the bid as shown in the proposal

# Withholding Exemption Certificate

**2012**

(This form can only be used to certify exemption from nonresident withholding under California Revenue and Taxation Code (R&TC) Section 18662. Do not use this form for exemption from wage withholding.)

**590**

File this form with your withholding agent. (Please type or print)

Withholding agent's name \_\_\_\_\_

Payee's name \_\_\_\_\_

Payee's  SOS file no.  SSN or ITIN  CA corp. no.  FEIN

Address (number and street, PO Box, or PMB no.) \_\_\_\_\_

Apt. no./ Ste. no. \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ ZIP Code \_\_\_\_\_

Read the following carefully and check the box that applies to the payee.

I certify that for the reasons checked below, the payee named on this form is exempt from the California income tax withholding requirement on payment(s) made to the entity or individual.

**Individuals — Certification of Residency:**

I am a resident of California and I reside at the address shown above. If I become a nonresident at any time, I will promptly notify the withholding agent. See instructions for General Information D, Who is a Resident, for the definition of a resident.

**Corporations:**

The above-named corporation has a permanent place of business in California at the address shown above or is qualified through the California Secretary of State (SOS) to do business in California. The corporation will file a California tax return and withhold on payments of California source income to nonresidents when required. If this corporation ceases to have a permanent place of business in California or ceases to do any of the above, I will promptly notify the withholding agent. See instructions for General Information F, What is a Permanent Place of Business, for the definition of permanent place of business.

**Partnerships or limited liability companies (LLC):**

The above-named partnership or LLC has a permanent place of business in California at the address shown above or is registered with the California SOS, and is subject to the laws of California. The partnership or LLC will file a California tax return and will withhold on foreign and domestic nonresident partners or members when required. If the partnership or LLC ceases to do any of the above, I will promptly inform the withholding agent. For withholding purposes, a limited liability partnership (LLP) is treated like any other partnership.

**Tax-Exempt Entities:**

The above-named entity is exempt from tax under California Revenue and Taxation Code (R&TC) Section 23701 \_\_\_\_\_ (insert letter) or Internal Revenue Code Section 501(c) \_\_\_\_\_ (insert number). The tax-exempt entity will withhold on payments of California source income to nonresidents when required. If this entity ceases to be exempt from tax, I will promptly notify the withholding agent. Individuals cannot be tax-exempt entities.

**Insurance Companies, Individual Retirement Arrangements (IRAs), or Qualified Pension/Profit Sharing Plans:**

The above-named entity is an insurance company, IRA, or a federally qualified pension or profit-sharing plan.

**California Trusts:**

At least one trustee and one noncontingent beneficiary of the above-named trust is a California resident. The trust will file a California fiduciary tax return and will withhold on foreign and domestic nonresident beneficiaries when required. If the trustee becomes a nonresident at any time, I will promptly notify the withholding agent.

**Estates — Certification of Residency of Deceased Person:**

I am the executor of the above-named person's estate. The decedent was a California resident at the time of death. The estate will file a California fiduciary tax return and will withhold on foreign and domestic nonresident beneficiaries when required.

**Nonmilitary Spouse of a Military Servicemember:**

I am a nonmilitary spouse of a military servicemember and I meet the Military Spouse Residency Relief Act (MSRRA) requirements. See instructions for General Information E, MSRRA.

**CERTIFICATE:** Please complete and sign below.

Under penalties of perjury, I hereby certify that the information provided in this document is, to the best of my knowledge, true and correct. If conditions change, I will promptly notify the withholding agent.

Payee's name and title (type or print) \_\_\_\_\_ Daytime telephone no. \_\_\_\_\_

Payee's signature ► \_\_\_\_\_ Date \_\_\_\_\_

# Instructions for Form 590

## Withholding Exemption Certificate

References in these instructions are to the California Revenue and Taxation Code (R&TC).

### General Information

For purposes of California income tax, references to a spouse, husband, or wife also refer to a Registered Domestic Partner (RDP) unless otherwise specified. For more information on RDPs, get FTB Pub. 737, Tax Information for Registered Domestic Partners.

**Private Mail Box (PMB)** – Include the PMB in the address field. Write “PMB” first, then the box number. Example: 111 Main Street PMB 123.

**Foreign Address** – Enter the information in the following order: City, Country, Province/Region, and Postal Code. Follow the country’s practice for entering the postal code. **Do not** abbreviate the country’s name.

### A Purpose

Use Form 590, Withholding Exemption Certificate, to certify an exemption from nonresident withholding. California residents or entities should complete and present Form 590 to the withholding agent. The withholding agent is then relieved of the withholding requirements if the agent relies in good faith on a completed and signed Form 590 unless told by the FTB that the form should not be relied upon.

The following are excluded from withholding and completing this form:

- The United States and any of its agencies or instrumentalities
- A state, a possession of the United States, the District of Columbia, or any of its political subdivisions or instrumentalities
- A foreign government or any of its political subdivisions, agencies, or instrumentalities

**Important – This form cannot be used for exemption from wage and real estate withholding.**

- If you are an employee, any wage withholding questions should be directed to the FTB General Information number, 800.852.5711. Employers should call **888.745.3886** or go to **edd.ca.gov**.
- Sellers of California real estate use Form 593-C, Real Estate Withholding Certificate, to claim an exemption from real estate withholding.

### B Requirement

R&TC Section 18662 requires withholding of income or franchise tax on payments of California source income made to nonresidents of California.

Withholding is required on the following, but is not limited to:

- Payments to nonresidents for services rendered in California.
- Distributions of California source income made to domestic nonresident S corporation

shareholders, partners and members and allocations of California source income made to foreign partners and members.

- Payments to nonresidents for rents if the payments are made in the course of the withholding agent’s business.
- Payments to nonresidents for royalties with activities in California.
- Distributions of California source income to nonresident beneficiaries from an estate or trust.
- Prizes and winnings received by nonresidents for contests in California.

However, withholding is optional if the total payments of California source income are \$1,500 or less during the calendar year.

For more information on withholding get FTB Pub. 1017, Resident and Nonresident Withholding Guidelines. To get a withholding publication see General Information H, Publications, Forms, and Additional Information.

**Backup Withholding** – Beginning on or after January 1, 2010, with certain limited exceptions, payers that are required to withhold and remit backup withholding to the Internal Revenue Service (IRS) are also required to withhold and remit to the Franchise Tax Board (FTB). The California backup withholding rate is 7% of the payment. For California purposes, dividends, interests, and any financial institutions release of loan funds made in the normal course of business are exempt from backup withholding. For additional information on California backup withholding, go to **ftb.ca.gov** and search for **backup withholding**.

If a payee has backup withholding, the payee must contact the FTB to provide a valid Taxpayer Identification Number (TIN) before filing a tax return. The following are acceptable TINs: social security number (SSN); individual taxpayer identification number (ITIN); federal employer identification number (FEIN); California corporation number (CA Corp No.); or Secretary of State (SOS) file number. Failure to provide a valid TIN will result in the denial of the backup withholding credit. For more information go to **ftb.ca.gov** and search for **backup withholding**.

### C Who Certifies this Form

Form 590 is certified by the payee. An incomplete certificate is invalid and the withholding agent should not accept it. If the withholding agent receives an incomplete certificate, the withholding agent is required to withhold tax on payments made to the payee until a valid certificate is received. In lieu of a completed certificate on the preprinted form, the withholding agent may accept as a substitute certificate a letter from the payee explaining

why the payee is not subject to withholding. The letter must contain all the information required on the certificate in similar language, including the under penalty of perjury statement and the payee’s taxpayer identification number. The withholding agent must retain a copy of the certificate or substitute for at least four years after the last payment to which the certificate applies, and provide it upon request to the Franchise Tax Board.

For example, if an entertainer (or the entertainer’s business entity) is paid for a performance, the entertainer’s information must be provided. **Do not** submit the entertainer’s agent or promoter information.

The grantor of a grantor trust shall be treated as the payee for withholding purposes. Therefore, if the payee is a grantor trust and one or more of the grantors is a nonresident, withholding is required. If all of the grantors on the trust are residents, no withholding is required. Resident grantors can check the box on Form 590 labeled “Individuals — Certification of Residency.”

### D Who is a Resident

A California resident is any individual who is in California for other than a temporary or transitory purpose or any individual domiciled in California who is absent for a temporary or transitory purpose.

An individual domiciled in California who is absent from California for an uninterrupted period of at least 546 consecutive days under an employment-related contract is considered outside California for other than a temporary or transitory purpose.

An individual is still considered outside California for other than a temporary or transitory purpose if return visits to California do not total more than 45 days during any taxable year covered by an employment contract.

This provision does not apply if an individual has income from stocks, bonds, notes, or other intangible personal property in excess of \$200,000 in any taxable year in which the employment-related contract is in effect.

A spouse/RDP absent from California for an uninterrupted period of at least 546 days to accompany a spouse/RDP under an employment-related contract is considered outside of California for other than a temporary or transitory purpose.

Generally, an individual who comes to California for a purpose which will extend over a long or indefinite period will be considered a resident. However, an individual who comes to perform a particular contract of short duration will be considered a nonresident.

For assistance in determining resident status,

get FTB Pub. 1031, Guidelines for Determining Resident Status, and FTB Pub. 1032, Tax Information for Military Personnel, or call the FTB at 800.852.5711 or 916.845.6500.

## E Military Spouse Residency Relief Act (MSRRA)

Generally, for tax purposes you are considered to maintain your existing residence or domicile. If a military servicemember and nonmilitary spouse have the same state of domicile, the MSRRA provides:

- A spouse shall not be deemed to have lost a residence or domicile in any state solely by reason of being absent to be with the servicemember serving in compliance with military orders.
- A spouse shall not be deemed to have acquired a residence or domicile in any other state solely by reason of being there to be with the servicemember serving in compliance with military orders.

**Domicile** is defined as the one place:

- Where you maintain a true, fixed, and permanent home
- To which you intend to return whenever you are absent

A military servicemember's nonmilitary spouse is considered a nonresident for tax purposes if the servicemember and spouse have the same domicile outside of California and the spouse is in California solely to be with the servicemember who is serving in compliance with Permanent Change of Station orders. Note: California may require nonmilitary spouses of military servicemembers to provide proof that they meet the criteria for California personal income tax exemption as set forth in the MSRRA.

Income of a military servicemember's nonmilitary spouse for services performed in California is not California source income subject to state tax if the spouse is in California to be with the servicemember serving in compliance with military orders, and the servicemember and spouse have the same domicile in a state other than California.

For additional information or assistance in determining whether the applicant meets the MSRRA requirements, get FTB Pub. 1032.

## F What is a Permanent Place of Business

A corporation has a permanent place of business in California if it is organized and existing under the laws of California or if it is a foreign corporation qualified to transact intrastate business by the SOS. A corporation that has not qualified to transact intrastate business (e.g., a corporation engaged exclusively in interstate commerce) will be considered as having a permanent place of business in California only if it maintains a permanent office in California that is permanently staffed by its employees.

## G Withholding Agent

Keep Form 590 for your records. **Do not** send this form to the FTB unless it has been specifically requested.

For more information, contact Withholding Services and Compliance, see General Information H.

The payee must notify the withholding agent if any of the following situations occur:

- The individual payee becomes a nonresident.
- The corporation ceases to have a permanent place of business in California or ceases to be qualified to do business in California.
- The partnership ceases to have a permanent place of business in California.
- The LLC ceases to have a permanent place of business in California.
- The tax-exempt entity loses its tax-exempt status.

The withholding agent must then withhold and report the withholding using Form 592, Resident and Nonresident Withholding Statement, and remit the withholding using Form 592-V, Payment Voucher for Resident and Nonresident Withholding. Form 592-B, Resident and Nonresident Withholding Tax Statement, is retained by the withholding agent

and a copy is given to the payee.

## H Publications, Forms, and Additional Information

You can download, view, and print California tax forms and publications at [ftb.ca.gov](http://ftb.ca.gov).

To have publications or forms mailed to you or to get additional nonresident withholding information, contact the Withholding Services and Compliance.

WITHHOLDING SERVICES AND  
COMPLIANCE MS F182  
FRANCHISE TAX BOARD  
PO BOX 942867  
SACRAMENTO CA 94267-0651

Telephone: **888.792.4900**  
916.845.4900

Fax: 916.845.9512

OR to get forms by mail write to:

TAX FORMS REQUEST UNIT MS F284  
FRANCHISE TAX BOARD  
PO BOX 307  
RANCHO CORDOVA CA 95741-0307

For all other questions unrelated to withholding or to access the TTY/TDD numbers, see the information below.

### Internet and Telephone Assistance

Website: [ftb.ca.gov](http://ftb.ca.gov)  
Telephone: 800.852.5711 from within the United States  
916.845.6500 from outside the United States  
TTY/TDD: 800.822.6268 for persons with hearing or speech impairments

### Asistencia Por Internet y Teléfono

Sitio web: [ftb.ca.gov](http://ftb.ca.gov)  
Teléfono: 800.852.5711 dentro de los Estados Unidos  
916.845.6500 fuera de los Estados Unidos  
TTY/TDD: 800.822.6268 personas con discapacidades auditivas y del habla



# County of El Dorado

OFFICE OF AUDITOR-CONTROLLER

360 FAIR LANE  
PLACERVILLE, CALIFORNIA 95667  
Phone (530) 621-5487 FAX (530) 295-2535

**JOE HARN, CPA**  
Auditor-Controller

**BOB TOSCANO**  
Assistant Auditor-Controller

## PAYEE DATA RECORD

(Required in lieu of IRS W-9 when receiving payment from the County of El Dorado)

Version: June 2011

<b>1</b>	<b>INSTRUCTIONS:</b> Complete all information on this form. Sign, date, and return to the address shown at the bottom of this page. Prompt return of this <b>fully completed</b> form will prevent delays in processing payments. Information provided in this form will be used by the County of El Dorado to prepare Information Returns (1099), for withholding on payments to nonresident payees, and for reporting to the Employment Development Department (EDD). See reverse side for more information and Privacy Statement.		
<b>2</b>	PAYEE'S LEGAL BUSINESS NAME (Type or Print)		
	INDIVIDUALS AND SOLE PROPRIETORS – ENTER NAME AS SHOWN ON SSN (Last, First, M.I.)		PHONE NUMBER:
	MAILING ADDRESS		BUSINESS ADDRESS
	CITY, STATE, ZIP CODE		CITY, STATE, ZIP CODE
<b>3</b>	ENTER FEDERAL EMPLOYER IDENTIFICATION NUMBER (FEIN): <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<b>NOTE:</b> Individuals and sole proprietors are required to provide their SSN (FEIN may be provided in addition to but not in lieu of the SSN)	
PAYEE ENTITY TYPE  CHECK ONE BOX ONLY	<input type="checkbox"/> PARTNERSHIP                      CORPORATION:  <input type="checkbox"/> ESTATE OR TRUST <input type="checkbox"/> MEDICAL (e.g., dentistry, psychotherapy, chiropractic, etc.) <input type="checkbox"/> LIMITED LIABILITY COMPANY <input type="checkbox"/> LEGAL (e.g., attorney services)  <input type="checkbox"/> EXEMPT (nonprofit)  <input type="checkbox"/> ALL OTHER		
	<input type="checkbox"/> INDIVIDUAL OR SOLE PROPRIETOR ENTER SOCIAL SECURITY NUMBER: <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
	<small>(SSN required by authority of California Revenue and Tax Code Section 18646)</small>		
<b>4</b>	<b>Applicable only if the business address provided in Part 2 is not a physical California address</b> <b>NOTE:</b> If you are a California nonresident providing services to County of El Dorado in California, seven percent (7%) of the payment will be withheld and remitted to the California Franchise Tax Board (FTB) unless you are exempt or have obtained a waiver from FTB. Mark if any of the following apply: <input type="checkbox"/> Exempt from withholding of California income (attach California Form 587 or 590) <input type="checkbox"/> Obtained Franchise Tax Board waiver of State withholding (attach a copy) If you are a California nonresident and charge California sales tax, a valid California sales tax permit number is required: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
<b>5</b>	I hereby certify under penalty of perjury that the information provided on this document is true and correct. Should my residency status change, I will promptly notify the County of El Dorado at the address listed below.		
	AUTHORIZED PAYEE REPRESENTATIVE'S NAME (Type or Print)		TITLE
	SIGNATURE	DATE	TELEPHONE
<b>6</b>	Please return completed form to:  Department/Office: _____ Mailing Address: _____ City/State/Zip: _____ Telephone: _____ Fax: _____		

**PAYEE DATA RECORD**

(REVERSE)

<p><b>1</b></p>	<p><b>Requirement to Complete Payee Data Record</b></p> <p>A completed Payee Data Record is required for payments to all non-governmental entities and will be kept on file at the County of El Dorado Auditor-Controller's Office.</p> <p>Payees who do not wish to complete the Payee Data Record may elect to not do business with the County of El Dorado. If the payee does not complete the form and the required payee data is not otherwise provided, payment may be reduced for federal backup withholding and nonresident State income tax withholding. Amounts reported on Information Returns (1099) are in accordance with the Internal Revenue Code and the California Revenue and Taxation Code.</p>
<p><b>2</b></p>	<p>Enter the payee's legal business name. Sole proprietorships must also include the owner's full name. An individual must list his/her full name. The mailing address should be the address at which the payee chooses to receive correspondence. Do not enter payment address or lock box information here.</p>
<p><b>3</b></p>	<p>Check the box that corresponds to the payee business type. Check only one box. Corporations must check the box that identifies the type of corporation. The County of El Dorado requires that all parties entering into business transactions that may lead to payment(s) from the County provide their Taxpayer Identification Number (TIN). The TIN is required by the California Revenue and Taxation Code Section 18646 to facilitate tax compliance enforcement activities and the preparation of Form 1099 and other information returns as required by the Internal Revenue Code Section 6109(a).</p> <p>The TIN for individuals and sole proprietorships is the Social Security Number (SSN). Only partnerships, estates, trusts, limited liability corporations and corporations will enter their Federal Employer Identification Number (FEIN).</p>
<p><b>4</b></p>	<p><b>Are you a California resident or nonresident?</b></p> <p>A corporation will be defined as a "resident" if it has a permanent place of business in California or is qualified through the Secretary of State to do business in California.</p> <p>A partnership is considered a resident partnership if it has a permanent place of business in California. An estate is a resident if the decedent was a California resident at time of death. A trust is a resident if at least one trustee is a California resident.</p> <p>For individuals and sole proprietors, the term "resident" includes every individual who is in California for other than a temporary or transitory purpose and any individual domiciled in California who is absent for a temporary or transitory purpose. Generally, an individual who comes to California for a purpose that will extend over a long or indefinite period will be considered a resident. However, an individual who comes to perform a particular contract of short duration will be considered a nonresident.</p> <p>Payments to all nonresidents may be subject to withholding. Nonresident payees performing services in California or receiving rent, lease, or royalty payments from property (real or personal) located in California will have 7% of their total payments withheld for State income taxes. However, no withholding is required if total payments to the payee are \$1,500 or less for the calendar year. Nonresidents who have been granted a waiver on payments of California source income from the California Franchise Tax Board must submit a copy of the waiver.</p> <p>For information on Nonresident Withholding, contact the Franchise Tax Board at the numbers listed below:                  Withholding Services and Compliance Section: 1-888-792-4900 E-mail address: wscs.gen@ftb.ca.gov                  For hearing impaired with TDD, call: 1-800-822-6268 Website: www.ftb.ca.gov</p> <p>California nonresidents charging California sales tax are required to provide their California sales tax number.</p>
<p><b>5</b></p>	<p>Provide the name, title, signature, and telephone number of the authorized individual completing this form. Provide the date the form was completed.</p>
<p><b>6</b></p>	<p>This section must be completed by the department/office requesting the information.</p>
	<p><b>Privacy Statement</b></p> <p>Section 7(b) of the Privacy Act of 1974 (Public Law 93-579) requires that any federal, State, or local governmental agency, which requests an individual to disclose their social security account number, shall inform that individual whether that disclosure is mandatory or voluntary, by which statutory or other authority such number is solicited, and what uses will be made of it.</p> <p>It is mandatory to furnish the information requested. Federal law requires that payment for which the requested information is not provided is subject to federal backup withholding and State law imposes noncompliance penalties of up to \$20,000.</p> <p>You have the right to access records containing your personal information, such as your SSN. To exercise that right, please contact the County of El Dorado Auditor-Controller's Office in writing.</p> <p>All questions should be referred to the County of El Dorado Auditor-Controller's Office.</p>



**CERTIFICATE OF INSURANCE FORM FOR CONTRACTORS, ARCHITECTS AND/OR ENGINEERS**

CERTIFICATE ISSUER  PHONE ( )	DATE EXECUTED:  THIS CERTIFICATE DOES NOT AMEND, EXTEND, OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. COMPANIES AFFORDING COVERAGE		
INSURED  PHONE ( )	COMPANY A LETTER  COMPANY B LETTER  COMPANY C LETTER	COMPANY RATING  COMPANY RATING  COMPANY RATING	
PROJECT DESCRIPTION  PROJECT TITLE:  PROJECT NUMBER:  LOCATION:	COMPANY D LETTER  COMPANY E LETTER	COMPANY RATING  COMPANY RATING	

THIS IS TO CERTIFY that policies of insurance listed below have been issued to the insured named above for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusion and conditions of such policies.

CL	Type of Insurance Coverage	Policy Number	Policy Effective Date	Policy Expiration Date	Limits of Liability (in Thousands)
	GENERAL LIABILITY <input type="checkbox"/> Commercial General Liability <input type="checkbox"/> Occurrence <input type="checkbox"/> Claims Made <input type="checkbox"/> Owner's & Contractor's Protective <input type="checkbox"/> General Aggregate * <input type="checkbox"/> Per Project <input type="checkbox"/> Per Location				GENERAL AGGREGATE \$ PRODUCTS-COMP/OPS AGGREGATE \$ PERSONAL & ADVERTISING INJURY \$ EACH OCCURRENCE \$ FIRE DAMAGE (ANY ONE FIRE) \$ MEDICAL EXPENSES (ANY ONE PERSON) \$ DEDUCTIBLE \$
	ARCHITECT'S AND/OR ENGINEER'S PROFESSIONAL LIABILITY <input type="checkbox"/> Claims Made <input type="checkbox"/> Project				GENERAL AGGREGATE \$ EACH CLAIM \$  DEDUCTIBLE \$
	AUTOMOBILE LIABILITY <input type="checkbox"/> Any Auto <input type="checkbox"/> All Owned Autos <input type="checkbox"/> Scheduled Autos <input type="checkbox"/> Hired Autos <input type="checkbox"/> Non-Owned Autos <input type="checkbox"/> Garage Liability				COMBINED SINGLE LIMIT \$ BODILY INJURY (PER PERSON) \$ BODILY INJURY (PER ACCIDENT) \$ PROPERTY DAMAGE \$ DEDUCTIBLE \$
	EXCESS LIABILITY <input type="checkbox"/> Umbrella Form <input type="checkbox"/> Other Than Umbrella Form				EACH OCCURRENCE \$ AGGREGATE \$
	<input type="checkbox"/> WORKER'S COMPENSATION				-----STATUTORY-----
	EMPLOYER'S LIABILITY				(EACH ACCIDENT) \$ (DISEASE - POLICY LIMIT) \$ (DISEASE - EACH EMPLOYEE) \$
	OTHER <input type="checkbox"/> Installation Floater <input type="checkbox"/> Builder's Risk <input type="checkbox"/>				\$ \$ \$

\* The General Aggregate limit, under Limits of Insurance, applies separately to each of the projects away from premises owned by or rented by you.

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS/ADDITIONAL INSURED: The County of El Dorado its officers, officials, employees and volunteers are made additional insured, but only insofar as the operations under this contract are concerned. OTHER ADDITIONAL ISSURED:
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CERTIFICATE HOLDER	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED OR TERMINATED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL GIVE THIRTY (30) DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, IN ADVANCE OF THE EFFECTIVE DATE OF SUCH CANCELLATION OR TERMINATION.
	AUTHORIZED REPRESENTATIVE SIGNATURE, TITLE, TYPED NAME, SSN AND PHONE NUMBER:

**CONTRACTOR'S GUARANTEE**

**EL DORADO COUNTY DEPARTMENT OF TRANSPORTATION  
EQUIPMENT / VEHICLE WASH FACILITY  
CONTRACT NO. PW 12-30631, CIP NO. 81134**

As Contractor for the above referenced project, we hereby agree to repair or replace any or all work provided hereunder which is defective due to faulty materials, poor workmanship, or defective equipment at no expense to the County of El Dorado, ordinary wear and tear and unusual abuse or neglect excepted, during the term of the contract and provide the manufacturer one (1) year warranty period from the date of final acceptance of the work.

We further agree to repair or replace any and all adjacent areas which have been damaged or displaced due to our work performed under this contract at no expense to the County of El Dorado during the term of this contract for a period of one (1) year from the date of final acceptance of the work.

If a warranty or guarantee exceeding one (1) year is provided by the supplier or manufacturer of any equipment or materials used in this Project, or if a warranty or guarantee exceeding one (1) year is required elsewhere in these Contract Documents, then the guarantee for such equipment or materials shall be extended for such term. We expressly agrees to act as co-guarantor of such equipment and materials, and we shall supply County with all warranty and guaranty documents relative to equipment and materials incorporated in the job and guaranteed by its suppliers or manufacturers.

We agree that this guarantee and the rights and obligations accruing there from shall be in addition and not by way of limitation in any manner whatsoever to the rights, obligations, warranties or remedies otherwise provided for by law.

In the event of our failure to comply with the above mentioned conditions with (ten) 10 days after being notified in writing by the County of El Dorado, we hereby authorize the County of El Dorado to proceed to have said defects repaired and made good at our expense and we will honor and pay all costs and charges therefore upon written demand.

EXECUTED on this \_\_\_\_\_ day of \_\_\_\_\_, 2012.

CONTRACTOR

By \_\_\_\_\_

Title \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_

## PART 1 - GENERAL

## 1.01 GENERAL

- A. The name of the Project is Department of Transportation – Equipment/Vehicle Wash Facility. The project site is located at 2441 Headington Road, Placerville, California.

## 1.02 WORK INCLUDED

- A. Under a single contract construct the new equipment / vehicle wash facility, in conformance with Drawings and Specifications prepared by Stafford King Wiese Architects, Sacramento, California.
1. The LUMP SUM BASE BID for this project includes, but is not limited to the **LUMP SUM BID** for construction of a vehicle wash facility, including a prefabricated building with metal siding and roofing with a steel structure, foundation, CMU splash walls, a 2-stage, 2-level wash bay, sump pit and associated underground utility improvements and the **PLUS LUMP SUM BID** for Trench and Excavation Safety for Trenches and Excavations five feet deep and greater.
  2. LUMP SUM ADDITIVE #1 Construction of the Catwalk – Heavy Solids / Cold Wash Area. See A2.0, A3.0 & A3.1.
  3. LUMP SUM ADDITIVE #2 Construction of the Catwalk – Hot Water Pressure Wash Area. See A2.0, A3.0 & A3.1.
  4. LUMP SUM ADDITIVE #3 Installation of Pressure Wash Equipment. See P2.1. Installation of the equipment plumbing and electrical stub-outs is not included in LUMP SUM ADDITIVE #3 and is included in the LUMP SUM BASE BID.

## 1.03 HAZARDOUS MATERIALS

- A. No asbestos or asbestos containing materials have been knowingly specified for this project.
- B. If materials containing asbestos are brought to the site for use or installation in the Work, or if such materials are encountered in existing work upon which new work is being performed, notify Architect immediately.
- C. Provide written certification that no asbestos or asbestos containing materials have been included in the work, and that no tools, devices, clothing or equipment containing asbestos have been used to construct the work.
- D. Provide written certification that materials furnished and installed in the work comply with Rules on Architectural Coatings applicable in the area of the work as enforced by the Air Quality Management District (AQMD).

**1.04 PREVIOUSLY COMPLETED WORK**

- A. Work on the Project which will be executed by others prior to start of Work of this Contract is as follows:
  - 1. Demolition of existing building.

**1.05 ORDER OF WORK**

- A. Portions of the sewer line must be constructed in specific order. The Contractor shall refer to contract drawings C5.0.
- B. Order of Work the Contractor shall consider
  - 1. The existing sand-oil separator and vehicle wash system shall remain operational during construction.
  - 2. Construction of sewer line A from sta. 0+30± thru sta. 2+00 shall be done in a manner that disrupts the existing sewer service the least amount possible.
  - 3. Sewer line A shall be operational from sta. 0+30± thru sta. 2+70 before intercepting the existing 4" sewer line at sta. 2+67.50 22' left.
  - 4. Relocation of the existing sand-oil separator shall be the last order of construction to minimize the down time of a working equipment / vehicle wash system.
  - 5. The contractor shall gain approval of construction sequence for sewer line A from the Contract Administrator prior to start of construction.

**1.06 CONCURRENT WORK**

- A. There will be no work executed by others on this project during the work of this contract.

**1.07 CONTRACTOR'S USE OF PREMISES**

- A. Confine operations at the site as directed by the Owner. Do not encumber site with extraneous materials or equipment.
- B. Roads for access to and from site, loading areas, and parking space are controlled by Owner. Coordinate use with Owner. Confine traffic and materials delivery as directed by Owner.
- C. Assume responsibility for protection and safekeeping of products stored on the site. Coordinate area of storage with Owner.

**1.08 EXISTING FACILITIES**

- A. Department of Transportation will maintain business hours during the construction period.
- B. Provide barricades to protect Owner, staff and public; refer to Section 01 50 00.

- C. Coordinate with Owner to maintain access to existing buildings.

1.09 PROTECTION

- A. Observe safety precautions, and erect barricades, warning signs and handrails to protect persons in and around the work areas.
- B. Conform to OSHA rules and regulations, and State Safety Regulations and Orders.

1.10 CONSTRUCTION STAKING

- A. The County will provide construction staking for the building footings and for the underground utility improvements.

\* End Section 01 11 01\*

## PART 1 - GENERAL

## 1.01 DESCRIPTION

- A. Bid additives described herein have been established to allow the Owner to determine total contract costs where additional work might be included.
- B. Determination of the lowest responsive, responsible bidder will be made based on the available construction budget and the Lump Sum Base Bid and Additives listed in the order of priority below whose total does not exceed the construction budget disclosed at the bid opening:
1. Lump Sum Bid Additive 3.
  2. Lump Sum Bid Additive 3 and Lump Sum Bid Additive 2.
  3. Lump Sum Bid Additive 3, Lump Sum Bid Additive 2, and Lump Sum Bid Additive 1.
- The actual construction budget will not be disclosed until after the deadline to receive bids has past and before bids are opened.
- C. Owner reserves the right to award; LUMP SUM BASE BID, some or all LUMP SUM BID ADDITIVES with the LUMP SUM BASE BID, or reject all bids.

## PART 2 - PRODUCTS

## 2.01 BID ADDITIVE NUMBER 1

- A. State amount to be added for the following:
1. Construct and install metal catwalks along grid lines 1.1 and 2, between Grids A to C, including stair sections at Grid A and four (4) bollards at stair sections.

## 2.02 BID ADDITIVE NUMBER 2

- A. State amount to be added for the following:
1. Construct and install metal catwalks along grid lines 1.1 and 2, between Grids C to E, including stair sections at Grid E and four (4) bollards at stair sections.

## 2.03 BID ADDITIVE NUMBER 3

- A. State amount to be added for the following:
1. Provide and install washing equipment. Refer to Contract Drawings A2.0, M2.1, P2.1, and E2.1. Refer to Specification Section 11 14 00 Vehicle Service Equipment.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Immediately after award of Contract, thoroughly and clearly advise personnel and suppliers as to nature and extent of bid additives selected by Owner.

\* End Section 01 23 00\*

**PART 1 - GENERAL****1.01 SUBMISSION PROCEDURES**

- A. Requests for additional information beyond that given in Contract Documents will be considered only when the request is in writing and fully documented on the form included at the end of this section.
- B. Prior to submitting a request conduct a review to determine that the information requested is not shown in the Contract Documents.
- C. **UNACCEPTABLE REQUESTS:**
  - 1. Requests that are confirmation of unauthorized changes to the work will be considered invalid.
  - 2. Requests that are requests for substitution which are not submitted within two (2) business days following the bid opening will be considered invalid.
- D. Requests for Information will not be considered without Contractor's recommended solution.
- E. Contractor may be backcharged by Owner for costs incurred by Architect related to responding to Requests for Information under the following conditions:
  - 1. If information is already contained in Contract Documents.
  - 2. If excessive time is required to resolve Contractor's remedial work.
  - 3. If excessive time is required to evaluate Contractor's proposed solution unless it is determined the plans are in error or lack sufficient information.

**1.02 SUBMISSION REQUIREMENTS**

- A. **RFI FORM - PORTION FILLED OUT BY CONTRACTOR**
  - 1. RFI Number: Sequential number starting with 1.
    - a. Number re-submissions with same number as original and add letter designation A., B., C., etc., in order submitted until resolution is achieved.
  - 2. Brief Description: Summary of content of request.
  - 3. Date Issued: Date RFI is submitted to Architect.
  - 4. Response Requested By: Date response is requested.
    - a. Allow at least 7 days for response.
    - b. Indicate if information requested is critical to project progress.



5. Contractor and Subcontractor/Supplier: Name, address, contact and phone number of Contractor and Subcontractor/Supplier.
6. Cost Impact: Indicate if RFI will affect Contract Cost.
7. Schedule Impact: Indicate if RFI will affect Project Schedule.
8. Detail/Drawing Reference: Indicate detail number and drawing number related to RFI.
9. Specification Reference: Indicate Specification Section and paragraph number related to RFI.
10. Information Requested: Description of information requested. Attach drawing or other documents required to clarify request.
11. Contractor's Recommended Solution: Description of Contractor's proposed solution. Attach drawing or other documents required to clarify Solution.

**1.03 ARCHITECT'S RESPONSE**

**A. ARCHITECT'S REVIEW:**

1. Allow seven (7) calendar days after receipt for Architect's response.
2. If more than ten (10) requests are received in one week Architect will schedule and extend response time as required to accomplish the reviews.

**B. RFI FORM - PORTION FILLED OUT BY ARCHITECT/ENGINEER.**

1. Response: Architect/Engineer response, Date Received, Response By, Date Answered.
2. Contractor is Directed To:
  - a. Proceed - No Cost or Time Impact: Contractor is directed to proceed with work described in response with no Contract cost or Time impact. Notify Architect prior to proceeding if Contract cost or Time impact will occur.
  - b. Do Not Proceed - Provide Cost Proposal: Contractor is directed to submit a cost proposal to Architect for the work described in response.
  - c. Proceed - Provide Cost Proposal: Contractor is directed to proceed with work described in response and to submit a cost proposal to Architect for the work within seven (7) days of date of response.
  - d. Proceed - Time & Materials: Contractor is directed to proceed with work described in response and to submit daily Time & Material worksheets to Inspector for verification.
3. RFI Classification: Architect will classify RFI as follows:
  - a. Information in Contract Documents: RFI is not valid because the information requested is contained in the Contract Documents.

- b. Remedial Work: Response constitutes remedial work to repair completed construction that is deemed not in compliance with the Contract Documents.
- c. Unknown Condition: RFI is valid because it addresses an unknown condition.
- d. Proposed Substitution: RFI is not valid because it is a request for substitution and should have been submitted with the Substitution Request form described in Section 01 33 00.
- e. Confirmation: RFI is not valid because it is a request for confirmation of direction previously given.
- f. Clarification: RFI is valid because the response provides information to assist Contractor in the execution of the Work.

\* End Section 01 26 14 \*

# Request For Information

STAFFORD KING WIESE ARCHITECTS

SKW Proj. No. 2957

Attn:

By Contractor	<b>Brief Description:</b>			<b>RFI NO.:</b>			
	<b>Date Issued:</b>						
	<b>Contractor:</b>			<b>Subcontractor/Supplier:</b>			
	<b>Contact:</b>			<b>Contact:</b>			
	<b>Phone:</b>			<b>Phone:</b>			
	<b>Cost Impact:</b>	<input type="checkbox"/>	No	<input type="checkbox"/>	Yes	<input type="checkbox"/>	Unknown
	<b>Schedule Impact:</b>	<input type="checkbox"/>	No	<input type="checkbox"/>	Yes	<input type="checkbox"/>	Unknown
	<b>Detail / Drawing Reference:</b>						
	<b>Information Requested:</b>						
	<b>Contractor's Proposed Solution: (This RFI will not be considered without Contractor's Proposed Cost Effective Solution. )</b>						
By Architect/Engineer	<i>Contractor may be backcharged by Owner for costs incurred by Architect related to responding to this RFI in accordance with the Contract Documents</i>						
	<b>Response:</b>						
	<b>Date Received:</b>		<b>Response By:</b>		<b>Date Answered:</b>		
	<b>Contractor is Directed To:</b>	<input type="checkbox"/>	Proceed - No Cost or Time Impact				
		<input type="checkbox"/>	Do Not Proceed - Provide Cost Proposal				
		<input type="checkbox"/>	Proceed _____	Provide Cost Proposal _____	Time and Materials _____		
<b>RFI Classification</b>	<input type="checkbox"/>	Information in Contract Documents	Remedial Work	Unknown Condition			
	<input type="checkbox"/>	Proposed Substitution	Confirmation	Clarification			

PART 1 - GENERAL

1.01 SUMMARY

- A. Prepare and submit estimated progress schedule for Work.
  - 1. Refer to Conditions of the Contract; Articles 3 and 4.
- B. Submittal of CPM schedule is Contractor's representation that schedule meets requirements of the Contract.

1.02 REQUIREMENTS

- A. CPM schedule should represent a practical plan to complete the work within the Contract Time.
- B. A completion date beyond the contractual completion date is not acceptable.
- C. If completion date is earlier than the contractual completion date Owner will not consider time extension requests until the contractual completion date is reached.

1.03 ALLOWANCE FOR ADVERSE WEATHER


- A. The contract duration includes allowance for normal adverse weather.
- B. Include an allotment of twenty-two (22) weather days for each winter weather period, defined as October through March, inclusive.
- C. Show weather days as a single, separate activity on the critical path.
- D. Owner approved weather delays will be applied to this allotment.
- E. If the allotment is exhausted Contractor will be granted non-compensable time extensions for Owner approved weather days.

1.04 ACTIVITIES

- A. Include each item described in Schedule of Values in sufficient detail to facilitate review of monthly progress payment.
- B. Include activities for required submittals. Refer to Section 01 33 01.

\* End Section 01 32 15 \*

## SUBMITTAL COVER SHEET

<b>a - CONTRACTOR</b>		<b>b - SUBCONTRACTOR / SUPPLIER</b> NAME: _____ ADDRESS: _____ CITY, STATE: _____ PHONE: _____ CONTACT: _____		JOB NO.  <b>2957</b>	
<b>c - SUBMITTAL DESCRIPTION</b>   RE-SUBMITTAL? NO <input type="checkbox"/> YES <input type="checkbox"/> OF PREVIOUS SUBMITTAL NO.    SUBSTITUTION NO <input type="checkbox"/> YES <input type="checkbox"/>				PROJ TITLE   <b>DOT Vehicle Wash Facility</b>	
<b>***** FOR STAFFORD KING WIESE USE ONLY *****</b>					
DATE REC'D FROM CONTR. _____	<b>CONSULTANT REVIEW</b> Civil _____    Struc _____ Mech _____    Elec _____ Kit _____    Hdw _____ CA _____    Other _____  Date: _____ Sent: _____  Due: _____  Rec'd: _____		DISTRIBUTION DATE _____  Contr. _____  Insp. _____  File _____  Owner _____  Other _____		<b>d - SPEC SECT</b>
REMARKS		<div style="text-align: center;"> <input type="checkbox"/> NO ACTION TAKEN  <input type="checkbox"/> NO EXCEPTIONS TAKEN  <input type="checkbox"/> MAKE CORRECTIONS NOTED  <input type="checkbox"/> REVISE AND RESUBMIT  <input type="checkbox"/> REJECTED         </div> <p>           Reviewing is only for conformance with the design concept of the project and compliance with the information given in the contract documents. The contractor is responsible for dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes or to the means, methods, techniques sequences, and procedures of construction; and for coordination of the work of all trades. The architect's acceptance of a specific item does not indicate approval of an assembly of which the item is a component. Contractor to review and concur with comments prior to proceeding with fabrication.         </p>			<b>e - SUB. NO.</b>
<b>STAFFORD KING WIESE</b> ARCHITECTS 		By: _____ Date _____			
622 20th Street, Sacramento, CA 95811					

## PART 1 - GENERAL

## 1.01 CODES IN EFFECT

- A. The codes that govern this project include but are not necessarily limited to the following:
1. 2010 California Building Code (CBC), CR, Title 24, Part 1 & 2.
  2. 2010 California Electrical Code (CEC), CCR, Title 24, Part 3
  3. 2010 California Mechanical Code (CMC), CCR, Title 24, Part 4
  4. 2010 California Plumbing Code (CPC), CCR, Title 24, Part 5
  5. 2010 California Energy Code, CCR, Title 24, Part 6
  6. 2010 California Fire Code (CFC), CCR, Title 24, Part 9

\* End Section 01 41 00 \*

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Owner will provide or employ and pay for services of an independent testing laboratory to perform specified testing.
  - 1. Cooperation: Contractor shall cooperate with laboratory to facilitate execution of its required services.
  - 2. Performance of Work: Employment of laboratory shall in no way relieve Contractor's obligations to perform work of Contract.
- B. Refer to Conditions of the Contract, Paragraph 4.2 Inspecting and Testing.

1.02 LABORATORY DUTIES

- A. Comply with ASTM E329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".
- B. COOPERATION: Cooperate with Owner, Architect, Engineer, and Contractor; provide qualified personnel after due notice.
- C. SERVICES:
  - 1. Perform specified inspections, sampling and testing of materials and methods of construction.
  - 2. Specified Standards: Verify compliance.
  - 3. Specified Materials: Ascertain compliance with requirements of Contract Documents.
- D. NOTIFICATION: Promptly inform Owner, Architect and Engineer of observed irregularities or deficiencies of work or products.
- E. REPORTS: Submit copies of reports simultaneously to Owner, Structural Engineer, Architect, General Contractor, and any other interested parties listed.
- F. ADDITIONAL TESTING: Perform additional tests as required by Architect or Owner. Note additional tests and any retests separately on each billing.

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. LABORATORY IS NOT AUTHORIZED TO:
  - 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Construction: Perform any duties of Contractor.

1.04 CONTRACTOR'S RESPONSIBILITIES

A. COOPERATION:

1. Laboratory Personnel: Cooperate with; provide access to Work, and to Manufacturer's operations.
2. Inspector: Cooperate with Inspector to secure and deliver to laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

B. MANUFACTURER'S TEST REPORTS: Furnish copies of products test reports as required.

C. FURNISH INCIDENTAL LABOR AND ASSISTANCE:

1. Access: Provide access to Work to be tested.
2. Facilitate: All inspections and tests.

D. SCHEDULING: Notify laboratory sufficiently in advance of operations, as specified in individual sections, to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, laboratory personnel and travel expenses will be paid by Owner and backcharged to Contractor. Contractor to notify Owner/Architect when all testing is scheduled.

E. ADDITIONAL SERVICES: Make arrangements with laboratory for additional samples and tests required for Contractor's convenience, or when initial tests indicate Work does not comply with Contract Requirements. Additional testing will be paid by Owner and backcharged to Contractor. Contractor to notify owner/architect when all testing is scheduled.

\* End Section 01 45 29 \*



**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Provide Temporary Facilities and Controls as shown, specified, and required.

**1.02 REQUIREMENTS OF REGULATORY AGENCIES**

- A. Temporary facilities and controls to be approved by authorities and regulatory agencies having jurisdiction, including insurance companies.

**1.03 PRODUCT HANDLING**

- A. Protect and maintain temporary facilities and controls in proper and safe condition throughout progress of work.
- B. In event of loss or damage, immediately make repairs and replacements at no additional cost to Owner.

**PART 2 - PRODUCTS**

**2.01 TEMPORARY UTILITIES**

**A. TEMPORARY WATER:**

- 1. Owner will provide and pay for water for construction purposes from existing source(s) on site.
  - a. Coordinate with Owner.
- 2. Provide temporary connections to source and sufficient hose or pipe to carry water to areas of site requiring water for construction.

**B. TEMPORARY POWER:**

- 1. Owner will provide temporary power free of charge from existing outlets.
  - a. Coordinate with Owner.
- 2. Construct and maintain temporary electrical facilities in accordance with Division of Industrial Safety "Electrical Safety Orders" (ESO), Public Utilities Commission "Rules for Overhead Line Construction" (G.O. 95), and requirements of the utility company providing service.

**2.02 SANITARY FACILITIES**

- A. Provide sufficient number of suitably enclosed chemical toilets with urinal.
- B. Provide properly mounted and adequate wash sinks connected to water supply.
- C. Provide clean, sanitary and adequate drinking water.

2.03 CONSTRUCTION EQUIPMENT

- A. Erect, equip, operate, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction.
- B. CONSTRUCTION ACCESS EQUIPMENT:
  - 1. Provide and maintain scaffolding, staging and similar equipment, as needed. Coordinate use and furnishing with subcontractors.

2.04 ENCLOSURES, FENCING AND BARRICADES

- A. Provide and maintain barricades, fencing, and other safety precautions to guard against personal injury and property damage as prescribed by authority having jurisdiction.
- B. Comply with Safety Orders issued by State of California, Division of Industrial Safety.
  - 1. Obtain copies of such Safety Orders as are applicable to type of work to be performed, and fully inform subcontractors and material suppliers as to the requirements of applicable Safety Orders.
- C. CONTRACTOR'S CORPORATION YARD: Located onsite as agreed to by Owner. Enclose with fences and gates as required for security, and as accepted.

2.05 SITE CONTROLS AND PARKING

- A. Owner will direct use access roads and entrances.
  - 1. Maintain roads and entrances in satisfactory condition during the contract time, and repair damages caused by work of this project.
  - 2. At completion of Contract, restore roads and entrances to condition at least equal to that existing at start of Contract.
- B. Owner will allocate available on-site storage and work areas to Contractor, subject to change as may be necessary by job progress. An area of approximately 2000 square feet (as shown on sheet C 5.1 of the Plans), on site will be made available to the Contractor for staging/storage.
- C. Observe and comply with rules and regulations in effect at occupied campuses or other facilities, including, but not restricted to, parking and traffic regulations, security restrictions, hours of access.
- D. Keep site clean and free of debris.
  - 1. Burning on premises is prohibited.
  - 2. Remove debris from site as it accumulates.
  - 3. Pay fees required for use of public dumps.
- E. DUST CONTROLS:

- 1. Outdoor Operations: Use water wagons or spray from hoses to control dust created by outdoor work operations.
- F. Provide and maintain dewatering and pumping facilities to keep site reasonably dry, and to protect materials and installed work from water damage until dewatering is no longer required.
- G. Contractor is responsible for security of areas of his work during entire time of Contract.
- H. As required by the California State Water Resources Control Board, only rainwater is permitted in storm drain system.
  - 1. Do not discharge wash down from equipment, vehicles, and other construction activities into storm drain system.
  - 2. Provide temporary containment, sediment traps, and/or gravel filters to prevent discharge of non-storm water into storm drain system.

**PART 3 - EXECUTION**

**3.01 MAINTENANCE AND REMOVAL**

- A. Maintain temporary facilities and controls as long as needed for safe and proper completion of Work and remove as rapidly as progress of Work will permit.

\* End Section 01 50 00 \*

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Design is based on first named product.
- B. No cost to be incurred by Owner for the use of second named product or accepted equal.
- C. Do not substitute materials or equipment unless specifically accepted by Architect.

## 1.02 SUBSTITUTIONS

- A. Substitutions will only be considered where Owner will receive benefit or because specified materials are no longer available due to no fault of Contractor.
  - 1. Identify the benefits to Owner either from a reduction of the Contract amount or from a reduction in Contract time based on acceptance of proposed substitution.
  - 2. List proposed benefits to Owner in request for substitution.
- B. Whenever a material, process or article is indicated or specified by patent or proprietary name and/or by name of manufacturer and is followed by the words "or accepted equal" such name is used for purpose of facilitating description of material and process desired.
  - 1. Contractor may offer any material, process or article which in his opinion is equal in every respect to that specified.
  - 2. If material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor must furnish material, process or article specified.
  - 3. Only one request for substitution for each material, process or article will be reviewed.
  - 4. Architect will charge Owner, who will backcharge Contractor, for services rendered in the review of substitutions.
- C. Submit requests for substitution with completely filled-out Substitution Request Form, included at end of this Section.
  - 1. Provide product identification, manufacturer's name and address, manufacturer's literature including product description, performance and test data and reference standards, samples and name and address of similar projects on which the product was used, including the date of installation.
  - 2. Submit side by side, item by item comparison of all characteristics of the specified product and the proposed product.
  - 3. Provide statement of effect of substitution on construction schedule.
- D. Substitutions indicated or implied on shop drawings or product data submittals will not be considered if they are without a formal substitution request.

1. Such substitutions will be considered null and void and specified item shall be installed.
- E. Acceptance of substitution does not relieve Contractor from responsibility for compliance with requirements of Contract Documents.
- F. Contractor is responsible, at his own expense, for changes in the work and re-approvals by authorities having jurisdiction, which are caused by substitution.

\* End Section 01 62 00 \*

PART 1 - GENERAL

1.01 SUMMARY

- A. Protect materials by means including, but not necessarily limited to, those described in this Section.

1.02 MANUFACTURER'S RECOMMENDATIONS

- A. Comply with manufacturer's recommendations on product handling, storage, and protection.

1.03 DELIVERY

- A. Deliver materials at such time so as not to impede progress of work.
- B. Deliver in manufacturer's original containers, with labels intact and legible.

1.04 PACKAGING

- A. Maintain packaged materials with seals unbroken and labels intact until time of use.
- B. Promptly remove damaged material and unsuitable items from job site, and promptly replace with material meeting the specified requirements.
- C. Architect may reject as non-complying such material and products that do not bear identification complying with specifications as to manufacturer, grade, quality, and other pertinent information.

1.05 PROTECTION

- A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.
- B. Protect finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by Owner.

1.06 REPAIRS AND REPLACEMENTS

- A. In event of damage, promptly make replacements and repairs to the approval of the Architect.
- B. Additional time required to secure replacements and to make repairs will not justify an extension in the Contract Time.

\* End Section 01 65 50 \*

**PART 1 - GENERAL****1.01 SUMMARY**

- A. Perform cutting, fitting and patching, and excavation and backfill required to complete the Work and to:
  - 1. Provide for installation of ill-timed work.
  - 2. Remove and replace defective work and work not conforming to requirements of Contract Documents.
  - 3. Provide routine penetrations of non-structural surfaces.

**1.02 SUBMITTALS**

- A. Submit written request in advance of cutting or alteration which affects:
  - 1. Structural elements or systems.
    - a. Submit drawings and applicable calculations of proposed modifications.
  - 2. Visual qualities of exposed elements.
  - 3. Work of Owner or separate contractor.
- B. Include in Request:
  - 1. Location and description of affected work.
  - 2. Necessity for operation.
  - 3. Description of proposed work and products to be used.
  - 4. Effect on work of Owner or separate contractor.
  - 5. Proposed date and time work will be executed.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Primary Products: Those required for original installation.
- B. Product Substitution: Submit request for substitution.

**PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Examine existing conditions prior to commencing work.
- B. Beginning operation is acceptance of existing conditions as they exist.

**3.02 PREPARATION**

- A. Provide temporary supports to ensure structural integrity of Work. Protect other portions of Work from damage.
- B. Provide protection from elements for portions of Work exposed by operation.
- C. Maintain excavations free from water.

**3.03 CUTTING**

- A. Do not cut structural elements or systems without Architect approval.
- B. Employ appropriate installer or fabricator with current experience in the type of material involved.
- C. Cut rigid materials using masonry saw or core drill. Obtain approval for use of pneumatic tools.

**3.04 PATCHING**

- A. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- B. Repair work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents.
- C. Refinish surfaces to provide even finish to match adjacent finishes.
  - 1. Refinish continuous surfaces to nearest intersection or change in material.
  - 2. Refinish entire unit of damaged assemblies.

\* End Section 01 73 29 \*



**PART 1 - GENERAL****1.01 SUMMARY**

- A. Perform operations necessary for closing out the Contract and assisting in Project acceptance.

**1.02 RELATED SECTIONS**

- A. Conditions of the Contract, Paragraph 6.6 Final Completion and Payment of Retention.

**1.03 FINAL CLEANING**

- A. At completion of work, remove marks, stains, fingerprints, dust, dirt, and paint drippings.

**1.04 REQUIREMENTS PREPARATORY TO PROJECT ACCEPTANCE**

- A. Perform the following prior to scheduling Architect's final Acceptance Tour.
  - 1. Submit certification that no new materials containing asbestos have been included in the work.
  - 2. Remove temporary facilities.
  - 3. Clean building and site.
  - 4. Post Instructions for equipment operation and maintenance.
  - 5. Submit Record Drawings.
  - 6. Submit Operation and Maintenance Manuals.
  - 7. Submit Guarantees.
  - 8. Prepare list of items to be completed.

**1.05 ACCEPTANCE TOUR**

- A. After requirements preparatory to project acceptance have been completed notify Architect with at least three day's notice to perform acceptance tour.
- B. If, in Architect's opinion, too many deficiencies exist, the tour will be terminated.
  - 1. Complete corrective measures and arrange another tour.
  - 2. Owner will compensate Architect for additional acceptance tour and deduct amount paid from Contractor's retention.
- C. Contractor or his principal superintendent, authorized to act in behalf of Contractor, to accompany Architect and Owner on acceptance tour.

- D. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will recommend that Owner accept Project and file Notice of Acceptance.
- E. If work is substantially completed in accordance with Contract Documents, and only minor corrective measures are required, Architect will recommend that Owner conditionally accept Project and file Notice of Acceptance based upon Contractor's assurance that corrective measures will be completed within shortest practicable time period.
- F. If work is not substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend that Owner not accept project, nor file Notice of Acceptance.
  - 1. Based on information gathered from acceptance tour, Contractor will be required to complete corrective measures and then call for another project acceptance tour following procedure outlined above.
  - 2. Owner will compensate Architect for additional acceptance tour and deduct amount paid from Contractor's retention.

\* End Section 01 77 00 \*

**PART 1 - GENERAL****1.01 SUMMARY**

- A. Refer to Conditions of the Contract, Paragraph 3.4.4 Record Drawings.
- B. Maintain Record Drawings at site.
- C. Record installed locations of underground, drainage, plumbing, and electrical work, including storm drain grate and invert elevations, and stubs for future connections.
- D. Locate items with reference to permanent landmarks or buildings and indicate depth below finish grade.

**1.02 DRAWINGS:**

- A. Architect will furnish hard copy drawings to Contractor when underground work has been completed.
- B. Transfer Record Drawing information to hard copy drawings.
- C. Emphasize changed items by drawing "clouds" around them.
- D. Use same symbols and designations as shown on Contract Drawings.
- E. Submit Record Drawings to Architect.
- F. Architect will review Record Drawings for completeness and legibility.

\* End Section 01 78 40 \*

## PART 1 – GENERAL

## 1.1 GENERAL REQUIREMENTS

- A. Requirements of Division 1 apply to all work of this section.

## 1.2 SCOPE

- A. Design, furnish and install forms for concrete as indicated on drawings and specified here. Remove forms and shores at specified time. Clean up.

## 1.3 RELATED WORK (See also Table of Contents)

- A. Metal Fabrications: Section 05 50 00.
- B. Items relating solely to mechanical or electrical work are included under those Divisions, except as specifically indicated otherwise on Drawings.
- C. Reinforcing Steel: Section 03 21 00.
- D. Cast-In-Place Concrete: Section 03 30 00.
- E. Pre-Fabricated Metal Building: Section 13 34 19

## 1.4 QUALITY ASSURANCE

- A. General:
  - 1. Conform to all requirements of ACI 347 and CBC Section 1905.1 and 1905.2.
  - 2. Concrete formwork shall be designed and constructed to safely support fluid concrete and superimposed construction loads without excessive deflection or concrete leakage. Provide bracing to maintain accurate alignment and to resist all anticipated lateral loads. Forms shall conform with drawings as to shape, line, and dimension. Design, engineering and construction of forms shall be Contractor's responsibility. Formwork for exposed concrete shall be constructed to tolerances indicated in ACI 303R.
  - 3. Cooperate and coordinate with other trades who furnish and/or install piping, conduit, reglets, anchors, inserts, sleeves, hangers, etc., as their work requires; including provisions for recesses and chases.
- B. Submittals: (Submit under provisions of Section 01 33 00)
  - 1. Product Data. Provide manufacturers data and installation instructions for the following:
    - a. Tie rods and spreaders.
    - b. Formwork for exposed concrete.
    - c. Form coatings and release agents.
- C. Standards and References: (Latest Edition unless otherwise noted)
  - 1. 2010 California Building Code (CBC).
  - 2. "Recommended Practice for Concrete Formwork", ACI 347, American Concrete Institute, latest edition.
  - 3. Standard Grading and Dressing Rules #17, West Coast Lumber Inspection Bureau (For Douglas Fir Form Lumber).
  - 4. U.S. Product Standard PS 1-83 (For Plywood Form Lumber).
  - 5. "Guide to Cast-In-Place Architectural Concrete Practice", ACI 303R, American Concrete Institute, latest edition.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Form Material:
  - 1. Smooth Concrete exposed to view: 5/8 inch minimum APA Plyform or steel.
  - 2. Concrete concealed from view: 5/8 inch minimum APA Plyform, steel or clean and sound 1 x 8 Standard Grade Douglas Fir.
- B. Fiber Forms: Tubular column forms spirally constructed of laminated plies of fiber. Plies shall be laminated using a non-water sensitive adhesive and surface wax impregnated for moisture protection. Forms shall give a smooth and seamless appearance to the cast concrete. Provide reveals, as shown on the drawings, as supplied by the form manufacturer. Forms shall be as manufactured by Sonoco Products, plastic lined; Burke Smoothtube by Burke Co.; or approved equal.
- C. Form Clamps: Assembly to have cone washers, (1 inch break back) 3/8" inch center rod.
- D. Form Ties:
  - 1. Concrete exposed to view: Snap ties allowing full 1 inch break back.
  - 2. Concrete concealed from view: Snap ties or wire.
  - 3. Verify special spacing requirements with architectural drawings at exposed concrete.
- E. Spreaders: Metal (no wood).
- F. Form Coating: Non-grain and non-staining types of form coating that will not leave a residual matter on the face of the concrete or adversely affect proper bonding of any subsequent paint or other surface applications.
  - 1. Form coating containing mineral oils or other non-drying materials will not be permitted for any concrete work.
- G. Joint Tape: No. 471 plastic film tape 3 inches wide, as manufactured by the Industrial Tape Division of 3M Company.
- H. Expansion Joint Filler (Preformed): 1/2 inch thick; Flexcell by Celotex Corporation, Elastic Fiber Expansion Joint by Phillip Carey Mfg. Co., or Sealtight Fiber Expansion Joint by W.R. Meadows, Inc.
- I. Extruded Polystyrene Foam: ASTM C578 type IV. Dow Chemical Corp. "Styrofoam", UC Industries "Foamular", or approved equal.

**PART 3 - EXECUTION****3.1 FORM CONSTRUCTION**

- A. Construct substantial forms to the shapes, lines, grades and elevations shown, sufficiently tight to prevent leakage of mortar, and tied, clamped and braced to prevent spreading, shifting or settling. Plywood joints shall be square and tight; plywood shall be arranged in such manner as to minimize number of joints and to provide a smooth, attractive finished concrete surface.
- B. Apply form coating to forms before reinforcing steel is in place.
- C. Sleeves, anchors and bolts, including those for angle frames, supports, ties and other materials in connection with concrete construction, shall be secured in position before the concrete is placed.

- D. Proper provisions shall be made for openings, blockouts, sleeves, offsets, sinkages, recesses and depressions required by other trades and suppliers prior to placing concrete.
  - 1. The Contractor shall also see that sleeves have been installed and other provisions have been made for the installation of mechanical, electrical and other equipment.
  - 2. Coordinate with all trades to insure proper placement of all items in forms and to provide proper blockouts wherever required.
- E. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced, as directed by Architect, with no additional cost to the Owner.
- F. Form Not Required: Concrete footings may be poured directly against cut earth where feasible and when the Architect's approval has been obtained.
  - 1. See structural drawings for requirements for placing concrete footings directly against earth without forms.
- G. Use ¾ inch minimum wood chamfer strips typical at all exposed corners unless noted otherwise on drawings.

### 3.2 CLEANING OF FORMS

- A. All dirt, chips, sawdust, rubbish, water, etc. shall be completely removed from form by water hosing and air pressure before any concrete is deposited therein. No wooden ties or blocking shall be left in concrete except where indicated for attachment of other work.
- B. Thoroughly clean and patch all holes in formwork and re-coat as required before reusing. Forms not suited to obtain concrete surfaces and tolerances in conformity with Contract requirements will be rejected by Architect.
  - 1. Reuse of forming materials shall be limited only as required to produce the finishes as specified, free from blemishes and other defects unless covered by other building materials in which case blemish free concrete is not required.

### 3.3 INSPECTION OF FORMS

- A. Notify the Structural Engineer at least 48 hours in advance of the beginning of pouring operations and at the completion of formwork and location of all construction joints. An inspection of forms and joints will be made for approval of finished work and general layout only. The foregoing inspection shall in no way relieve the Contractor of responsibility of design and safety or formwork, bulkheads and shorings.

### 3.4 REMOVAL OF FORMS AND SHORING

- A. Do not remove forms until concrete has attained sufficient strength to support its weight and any construction loading. Concrete must be allowed to cure long enough to avoid damage during form removal. Contractor or his representative in charge of concrete construction shall be present during removal of forms and shores, and shall be personally responsible for safety of this operation at all times and under all conditions.
- B. As a minimum, formwork and shoring shall remain in place for the following periods:
  - 1. Concrete on grade: 24 hours
  - 2. Walls and Columns: 3 days
  - 3. Formwork may be removed and reshores installed before the times indicated above, provided the concrete has cured sufficiently to avoid damage when formwork is removed. Shores must be immediately replaced with reshores in a sequence designed to avoid inducing stress in the concrete member.

3.5 ADJUSTING AND CLEANING

- A. Upon completion of this Work, clean up and remove from Site all equipment and debris resulting from this work.
- B. Surfaces to be painted shall be smooth and free of substances such as dirt, wax, excessive latence, grease or materials that would prevent proper bonding of finishes.
  - 1. Removal of foregoing contaminants, and complete removal of parting and curing compounds affecting proper paint bond, shall be responsibility of this Section of Work. Sandblast cleaning shall not be employed without specific approval of Structural Engineer.

END OF SECTION 03 10 00

**PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS**

- A. Requirements of Division 1 apply to all work of this Section.

**1.2 SCOPE**

- A. Unless noted otherwise, furnish and install reinforcing for all concrete, including dowels, chairs, spacers, bolsters, etc., necessary for supporting and fastening reinforcement in place as shown on the Drawings and specified herein.

**1.3 RELATED WORK (See also Table of Contents)**

- A. Concrete Formwork: Section 03 10 00.  
B. Cast-In-Place Concrete: Section 03 30 00.  
C. Concrete Unit Masonry: Section 04 22 00.

**1.4 QUALITY ASSURANCE****A. General:**

1. Acceptable Manufacturers: Regularly engaged in the manufacture of steel bar and welded wire fabric reinforcing.
2. Installer Qualifications: Installation shall be done only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics working under an experienced supervisor.
3. Welding Qualifications: Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4 - "Structural Welding Code Reinforcing Steel".
  - a. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
4. Reinforcement Work shall conform to ACI 301 and CBC Section 1907, as minimum standards.
5. Allowable Tolerances:
  - a. Fabrication:
    - 1) Sheared length: 1 inch.
    - 2) Depth of truss bars: Plus 0 minus ½-inch.
    - 3) Ties: Plus or minus ½-inch.
    - 4) All other bends: Plus or minus 1 inch.
  - b. Placement:
    - 1) Concrete cover to form surfaces: Plus or minus ¼-inch.
    - 2) Minimum spacing between bars: Plus or minus ¼-inch.
    - 3) Crosswise of members: Spaced evenly within 2 inches of stated separation.
    - 4) Lengthwise of members: Plus or minus 2 inches.
  - c. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 2 bar diameters.

**B. Standards and References: (Latest Edition unless otherwise noted):**

1. American Concrete Institute (ACI).
  - a. ACI 301 - "Specifications for Structural Concrete for Buildings".
  - b. ACI 315 - "Details and Detailing of Concrete Reinforcing".
  - c. ACI 318 - "Building Code Requirements for Reinforced Concrete"
2. American Society for Testing and Materials (ASTM).
  - a. ASTM A82 - "Cold Drawn Wire for Concrete Reinforcement".
  - b. ASTM A185 - "Welded Steel Wire Fabric for Concrete Reinforcement".



- c. ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
  - d. ASTM A706 – "Low Alloy Steel Deformed Bars for Concrete Reinforcement".
  3. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice".
  4. 2007 California Building Code (CBC),.
- C. Submittals: (Submit under provisions of Section 01 33 00)
1. Shop Drawings: Prepare in accordance ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars and shapes, dimensions and details of bar reinforcing and assemblies. Correctness of all reinforcing requirements and work is the responsibility of Contractor. Identify such shop drawings with reference thereon to sheet and detail numbers from Contract Drawings.
    - a. Do not use scaled dimensions from Contract Drawings in determining the lengths of reinforcing bars.
    - b. No reinforcing steel shall be fabricated without approved shop drawings.
    - c. Any deviations from the contract documents must be clearly indicated as a deviation on the shop drawings.
    - d. Areas of high congestion, including member joints and embed locations shall be fully detailed to verify clearances and assembly parameters and coordination with other trades.
  2. Certified mill test reports of supplied reinforcing indicating chemical and physical analysis. Tensile and bend tests shall be performed by the mill in accordance with ASTM A615.
  3. Product Data:
    - a. Manufacturer's specifications and installation instructions for splice devices.
    - b. Bar Supports.
  4. Certificates of Compliance with specified standards:
    - a. Reinforcing bars.
    - b. Welded wire fabric.
    - c. Welding electrodes.
  5. Samples: Only as requested by Architect.
- D. Tests and Inspections:
1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  2. All reinforcing steel whose properties are not identifiable by mill test reports shall be tested in accordance with ASTM A615. One Series of tests for each missing report to be borne by the Contractor.
  3. When inspections are indicated for reinforcement placement on the Structural drawings, a special inspector shall be employed to inspect reinforcing placement per CBC Section 1704.
  4. When tests are indicated for reinforcing steel on the structural drawings, the reinforcing steel used shall be tested in accordance with ASTM A615. One tensile and one bend test for each 2-1/2 tons of steel or fraction thereof, shall be made.
  5. Inspect shop and field welding in accordance with AWS D1.4, including checking materials, equipment, procedure and welder qualification as well as the welds. Inspector will use non-destructive testing or any other aid to visual inspection that he deems necessary to assure himself of the adequacy of the weld.
  6. Tests and inspection shall be performed by Owners testing agency except when needed to justify rejected work, in which case the cost of retests and reinspection shall be borne by the Contractor.

## 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and

length.

- B. Handle and store materials to prevent contamination.
  - 1. Store reinforcement in a manner that will prevent excessive rusting or coating with grease, oil, dirt, and other objectionable materials. Storage shall be in separate piles or racks so as to avoid confusion or loss of identification after bundles are broken.
- C. Deliver and store welding electrodes in accordance with AWS D12.1.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Reinforcement Bars: ASTM A615, Grade 40 for No. 3 and smaller bars; ASTM A615, Grade 60 for No. 4 and larger bars.
  - 1. Bar reinforcement to be welded shall meet chemical requirements of ASTM A706.
- B. Stirrups and Ties: ASTM A615, Grade 60 for No.4 and larger bars, ASTM A615, Grade 40 for No. 3 and smaller bars.
- C. Steel Dowels: Same grade as bars to which dowels are connected.
- D. Welded wire Fabric: ASTM A185.
- E. Tie Wires: FS-QQ-W-461, annealed steel, black, 16 gauge minimum.
- F. Welding Electrodes: AWS D1.4, low hydrogen, E70XX series.
- G. Bar Supports:
  - 1. Typical, unless noted otherwise; CRSI Class 2 wire supports.
    - a. Do not use wood, brick or other objectionable materials.
    - b. Do not use galvanized supports.
  - 2. Supports placed against ground: Pre-cast concrete blocks not less than 4 inches square with embedded wire.
- H. Mechanical Couplers: Comply with ACI 318 section 12.14.3.

## PART 3 - EXECUTION

### 3.1 FABRICATION

- A. Shop fabricate reinforcement to meet requirements of Drawings.
- B. Fabricate reinforcement in accordance with the requirements of ACI 315 where specific details are not shown or where Drawings and Specifications are not more demanding.
- C. Steel reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of bars for bending will not be permitted.
- D. Reinforcing shall not be field bent or straightened without structural engineer's review.
- E. Provide offsets in rebar (1:6 maximum) where required to maintain clearances.

### 3.2 CONDITION OF SURFACES

- A. Examine surfaces and conditions receiving or affecting the work. Do not proceed until unsuitable conditions have been corrected.

### 3.3 GENERAL

- A. Concrete shown without reinforcing shall be reinforced as similar parts shown with reinforcing except where concrete is specifically noted to be unreinforced.

### 3.4 PLACEMENT

- A. All reinforcement shall be accurately set in place, lapped, spliced, spaced rigidly and securely held in place and tied with specified wire at all splices and crossing points. All wire tie ends shall point away from the form. Carefully locate all dowel steel to align with wall and column steel.
  - 1. Bars shall be in long lengths with laps and splices as shown. Offset laps in adjacent bars. Place steel with clearances and cover as shown. Bar laps shall be as indicated on the Drawings. Tie all laps and intersections with the specified wire.
  - 2. The minimum clear spacing between parallel bars in a layer shall not be less than the larger bar diameter, 1" or 33% greater than the maximum aggregate size (nominal), whichever is greatest
  - 3. Reinforcing dowels for slabs shall be placed as detailed. Sleeves may be used if reviewed by the Structural Engineer before installation. Install dowel through all construction and expansion joints for all slabs on grade.
- B. Bar Supports: Support and securely fasten bars with chairs, spacers and ties to prevent displacement by construction loads or placement of concrete beyond the tolerances specified. Conform to CRSI as a minimum standard.
- C. Steel Adjustment:
  - 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
  - 2. Do not move bars beyond allowable without concurrence of Structural Engineer.
  - 3. Do not heat, bend, or cut bars without concurrence of Structural Engineer.
  - 4. Reinforcement shall not be bent after being embedded in hardened concrete.
- D. Splices:
  - 1. Splice reinforcing as shown.
  - 2. Lap Splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
  - 3. Splice Devices: Install in accordance with manufacturer's written instructions. Obtain Structural Engineer's review before using.
  - 4. Do not splice bars except at locations shown without concurrence of Structural Engineer.
    - a. Where splices in addition to those indicated are required, indicate location on shop drawings clearly and highlight "for Engineer's approval".
- E. Welding:
  - 1. Welding is not permitted unless specifically detailed on Drawings or approved by Engineer.
  - 2. Employ shielding metal-arc method and meet requirements of AWS D1.4.
  - 3. Welding is not permitted on bars where the carbon equivalent is unknown or is determined to exceed 0.55.
  - 4. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.
  - 5. Welding of crossing bars is not permitted.

- F. Welded Wire Fabric: Install in long lengths, lapping 24 inches at end splices and one mesh at side splices. Offset laps in adjacent widths. Place fabric in approximately the middle of the slab thickness unless shown otherwise on the Drawings by dimension. Wire tie lap joints at 12-inch centers. Use concrete blocks to support mesh in proper position.
- G. Reinforcement shall be free of mud, oil or other materials that may reduce bond at the time concrete is placed. Reinforcement with tightly adhered rust or mill scale will be accepted without cleaning provided that rusting has not reduced dimensions and weights below applicable standards. Remove loose rust.
- H. Protection against rust:
  - 1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
  - 2. Remove protective materials and clean reinforcement as required before proceeding with concrete placement.
- I. Drawing Notes: Refer to notes on Drawings for additional reinforcement requirements.
- J. Mechanical and Electrical Drawings: Refer to Mechanical and Electrical Drawings for formed concrete requiring reinforcing steel. All such steel shall be included under the work of this Section.

END OF SECTION 03 21 00

## PART 1 – GENERAL

## 1.1 GENERAL REQUIREMENTS

- A. Requirements of Division 1 apply to all Work of this Section.

## 1.2 SCOPE

- A. Furnish, place and finish cast in place concrete and related work as indicated on the Drawings and specified here.
  - 1. Install miscellaneous metal and other items furnished by other trades to be installed in concrete work.
  - 2. Provide facilities for job curing of test cylinders and transporting to Testing Laboratory.
- B. Provide grouting of steel base plates as indicated on the Drawings and specified here.

## 1.3 RELATED WORK (See also Table of Contents)

- A. Concrete Formwork: Section 03 10 00.
- B. Reinforcing Steel: Section 03 21 00.
- C. Mortar and Grout: 04 05 00.
- D. Metal Fabrications: Section 05 50 00.

## 1.4 QUALITY ASSURANCE

- A. Standards and References: (Latest Edition unless otherwise noted)
  - 1. 2007 California Building Code (CBC),.
  - 2. AMERICAN CONCRETE INSTITUTE (ACI)
    - a. ACI 117 Standard Tolerances for Concrete Construction and Materials
    - b. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
    - c. ACI 301 Structural Concrete for Buildings
    - d. ACI 305R Hot Weather Concreting
    - e. ACI 318 Building Code Requirements for Reinforced Concrete
  - 3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM C 31 Making and Curing Concrete Test Specimens in the Field
    - b. ASTM C 33 Concrete Aggregates
    - c. ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens
    - d. ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
    - e. ASTM C 94 Ready-Mixed Concrete
    - f. ASTM C 109 Test of Hydraulic Cement Concrete
    - g. ASTM C 143 Slump of Hydraulic Cement Concrete
    - h. ASTM C 150 Portland Cement
    - i. ASTM C 172 Sampling Freshly Mixed Concrete by the Volumetric Method
    - j. ASTM C 192 Making and Curing Concrete Test Specimens in the Laboratory
    - k. ASTM C 260 Air-Entraining Admixtures for Concrete
    - l. ASTM C 494 Chemical Admixtures for Concrete

- m. ASTM C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
  - n. ASTM C685 Volumetric Batching and continuous mixing
  - o. ASTM C1157 Hydraulic-Cement
- B. Submittals: (Submit under provisions of Section 01 33 00)
- 1. Concrete mix designs. See "Mix Design" below. Include results of test data used to establish proportions.
  - 2. Certificates of Compliance from Manufacturer
    - a. Cement certificates
    - b. Aggregates
    - c. Admixtures.
  - 3. Data regarding hardeners and sealers.
  - 4. Grout samples for sanded surface textures and colors upon Architects request only.
  - 5. Layout drawings for construction, control and expansion joints.
  - 6. Transit-mix delivery slips:
    - a. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
    - b. Make the record available to the Architect for his inspection upon request.
    - c. Upon completion of this portion of the work, deliver the record and the delivery slips to the Architect.
  - 7. See Section 03 21 00 for reinforcing steel submittals.
- C. Tests and Inspections:
- 1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2007 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  - 2. The following tests shall be made by a recognized testing laboratory selected by the Owner and approved by the governing agency. All tests shall be in accordance with the previously mentioned standards and ACI 318 Section 5.6. A complete record of all tests and inspections shall be kept
    - a. Compressive Strength: Make and cure in accordance with ASTM C-31. Test in accordance with ASTM C-39 and ACI 318 section 5.6
      - 1) A record shall be made of time and of locations of concrete from which samples were taken.
      - 2) Four identical cylinders shall be taken from each pour of 150 cubic yards or 5000 square feet or part thereof, being placed each day per ACI 318 5.6.2.1. One cylinder shall be tested at age 7 days, and two at age 28 days unless otherwise specified. Preserve remaining cylinder for future use.
      - 3) Test specimens in accordance with ASTM C157.
    - b. Concrete consistency (slump) shall be tested in accordance with ASTM C143.
  - 3. Provide full time inspection during the taking of test specimens and during the placing of all concrete and embedded steel.
  - 4. See Section 03210 for reinforcing steel tests and inspections.
  - 5. Provide concrete batch plant inspections per ASTM C685.

## PART 2 - PRODUCTS

### 2.1 MATERIAL

- A. Portland Cement: ASTM C 150, Type I or Type II. One brand of cement shall be used throughout to maintain uniform color for all exposed concrete.

- B. Concrete Aggregate: Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of appropriate ASTM Standards and ACI 318.
1. Concrete Aggregates for Standard Weight Concrete: ASTM C 33. Aggregate shall be crushed granite or Perkins type.
- C. Water: Clean and free from injurious amounts of oil, acids, alkali, organic matter and other deleterious substances; suitable for domestic consumption.
- D. Admixtures shall be subject to prior approval by the Architect, in accordance with ACI 318, Calcium Chloride is not permitted.
1. Water Reducing
    - a. ASTM C494 Type A - for use in cool weather.
    - b. ASTM C494 Type D - for use in hot weather.
  2. Air Entraining
    - a. Conform to ASTM C 260
  3. Fly Ash
    - a. Conform to ASTM C 618
  4. Mid-Range Water-Reducers
    - a. Master Builders "Polyheed" or approved equal.
  5. Fly Ash Pozzolan
    - a. Conforming to ASTM A-618 Class F
- E. Sand: Clean, dry, well graded.
- F. Abrasive aggregate for non-slip finish: Fused aluminum oxide grits, graded 12/30. Use factory-graded rustproof and non-glazing material that is unaffected by freezing, moisture and cleaning materials.
1. Products offered by manufacturers to comply with the above requirements include: A-H Alox; Anti-Hydro Waterproofing Co., Toxgrip; Toch Div. - Carboline, or approved equal.
- G. Expansion Joint Filler:
1. Joint fill shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.
- H. Bonding Agent: Sonneborn "Sonobond"; the Euclid Chemical Company "Euco-Weld"; Larsen Products Corp., "Weld-Crete" or approved equivalent.
- I. Concrete Sealer: Cure and Seal, as manufactured by the Euclid Chemical Company "Aqua-Cure VOX", Sonneborn "Kure-N-Seal WB", Burke "Spartan-Cote", W.R. Meadows "Intex" or approved equal conforming to ASTM C-309, Type I, Class B requirements, and conforming to State of California Air Resources Board VOC Regulations.
- J. Concrete Hardener/Sealer: Clear, water soluble, sprayable in-organic silicate based hardener/sealer or acrylic co-polymer resin. Products shall be equal to Euclid Chemical Company "Eucosil", Burke "Spartan-Cote", Sonneborn "Sonosil", W.R. Meadows "Pena-Lith", or approved equal and must conform to State of California Air Resources Board VOC Regulations.
- K. Concrete Cure: Water based curing compound conforming to ASTM C-309, Type 1, Class A and B, and AASHTO Specification M-148; Type 1, Class A and B requirements, and State of California Air Resources Board VOC Regulations. Product shall be equivalent to Euclid Chemical Company "Kurez VOX", Burke "No. 1127" or "Aqua-Resin Cure", W.R. Meadows "1100 Clear", or approved equal.

- L. Non-Shrink Grout: See Section 2.2.A.4

## 2.2 CONCRETE

### A. Concrete Mixes:

#### 1. Type A Concrete:

Strength: 3000 lbs. per square inch at 28 days.

Maximum Aggregate Size: 1-1/2 inch.

Cement Content: As determined by mix design (ACI 318 Section 5.2).

5.0 sacks per yard minimum.

Maximum Water to Cement Ratio: 0.58

Admixture: Water Reducing.

Weight: 145 lbs. per cubic foot

Use for unexposed foundation concrete except as otherwise specified. At Contractor's option, Type B concrete may be substituted for this.

#### 2. Type B Concrete:

Strength: 3500 lbs. per square inch at 28 days.

Maximum Aggregate Size: 1 inch.

Minimum Cement Content: As determined by mix design. (ACI 318 Section 5.2) 5.5 sacks per yard minimum.

Maximum Water to Cement Ratio: 0.45

Admixture: Water reducing.

Weight: 145 lbs. per cubic foot

Use for building slab on grade

Maximum Fly Ash content as a percentage of total cementitious material: 15%

#### 3. Type C Concrete:

Strength: 3000 lbs. per square inch at 28 days.

Maximum Aggregate Size: 1 inch.

Minimum Cement Content: 5 sacks per cubic yard.

Maximum Water to Cement Ratio: 0.60

Admixture: Water reducing.

Weight: 145 lbs. per cubic foot.

Use for concrete sidewalks, mechanical and electrical pads, miscellaneous non-structural slabs on grade.

#### 4. Grout shall be non-shrink, non-metallic, flowable Type "713" or "928" by Master Builders.

a. Metallic grout equivalent to Master Builders "Embeco" may be used only where covered by earth, concrete, or masonry.

b. Acceptance by Architect required before using.

### B. Consistency of Concrete: Concrete slump, measured in accordance with ASTM C 143, shall fall within following limits.

1. For General concrete placement: 3 inch plus or minus 1 inch.

2. Mixes employing the specified mid-range water reducer shall provide a measured slump not to exceed 7 inch  $\pm$ 1 inch after dosing, 2 inch  $\pm$ 1 inch before dosing.

3. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required to provide a workable consistency for pump mixers. Water shall not be added at the jobsite without written review by the structural engineer.

### C. Mix Design:

1. Initial mix design shall be prepared for all concrete in accordance with ACI 318 section 5.2. Mix proportions shall be determined in accordance with ACI 318 Section 5.3 or ACI 318 section 5.4. In the event that additional mix designs are required due to depletion of aggregate sources, aggregate not conforming to Specifications, or at request of Contractor, these mixes shall be prepared as above.



2. Contractor shall notify the Testing Laboratory and Architect of intent to use concrete pumps to place concrete so that mix designs can be modified accordingly.
  3. Fly ash shall not exceed fifteen percent of the total cementitious material.
  4. Provide 3% air entrainment typical, 6% for mixes with f'c greater than 4,000 psi.
  5. Owner's testing laboratory shall review all mix design before submittal.
- D. Mixing:
1. Equipment: All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.
  2. Method of Mixing:
    - a. Transit Mixing: Comply with ASTM C 94. Ready mixed concrete shall be used throughout, except as specified below.
    - b. On-Site Mixing: Use only if method of storing material, mixing of material and type of mixing equipment is approved by Architect. Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
    - c. Mixing shall be in accordance with ACI 318 5.8.
  3. Mixing Time: After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes nor more than 1-1/2 hours. Concrete shall be rejected if not deposited within the time specified.
  4. Admixtures:
    - a. Air entraining and chemical admixtures shall be charged into mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by manufacturer. Accuracy of measurement of any admixture shall be within plus or minus 3%.
    - b. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence, and provided further that admixtures used in that combination retain full efficiency and have no deleterious effect on concrete or on properties of each other.
    - c. All admixtures are to be approved by Structural Engineer prior to commencing this work.
  5. Retempering:
    - a. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall be discarded, not retempered.
    - b. Indiscriminate addition of water to increase slump is prohibited.
    - c. When concrete arrives at project with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded. Water shall be incorporated by additional mixing equal to at least half of total mixing time required. Any addition of water above that permitted by limitation of water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain proper water-cement ratio. Such additions shall only be used if approved by Architect. In any event, with or without addition of cement, not more than 2 gallons of water per cubic yard of concrete, over that specified in design mix, shall be added.
  6. Cold Weather Batching: When temperature is below 40 degrees F or is likely to fall below 40 degrees F during 24 hour period after placing, provide adequate equipment for heating concrete materials. No frozen materials or materials containing ice shall be used. Temperatures of separate materials, including mixing water, when placed in mixer shall not exceed 100 degrees F. When placed in forms concrete shall have a temperature between 50 degrees F and 85 degrees F.
  7. Hot Weather Batching: Concrete deposited in hot weather shall have a placing temperature below 85 degrees F. If necessary, ingredients shall be cooled to accomplish this.

## 2.3 FLOOR LEVELING AND FILL MATERIALS

- A. Epoxy Concrete Mortar: Floor leveling, non-shrink trowel applied epoxy concrete mortar; TPM 115 General Polymers Corp., A-H Emery Epoxy Topping #170 Anti-Hydro Corp., or approved equal, where areas to fill are less than 1/4 inch thick.
- B. Concrete Mortar: Floor leveling, patching and repair, non-shrink trowel applied concrete mortar; Master Builders EMBECO 411-A, Euclid EUCO, or approved equal, where areas of fill are greater than 1/4 inch thick.
- C. Cementitious Floor Leveling Material: Shall be self-leveling or trowelable with a minimum 28 day compressive strength of 3000 psi in accordance with ASTM C-109. Material shall be equal to Quikrete No. 1249, Ardex V-800/K-55, Mapei "Ultra/Flex" or approved equal.

## PART 3 - EXECUTION

## 3.1 PLACEMENT

- A. Before any concrete is placed, the following items of work shall have been completed in the area of placing.
  - 1. Forms shall have been erected, adequately braced, cleaned, sealed, lubricated if required, and bulkheaded where placing is to stop.
  - 2. Any wood forms other than plywood shall be thoroughly water soaked before placing any concrete. The wetting of forms shall be started at least 12 hours before concreting.
  - 3. Reinforcing steel shall have been placed, tied and supported.
  - 4. Embedded work of all trades shall be in place in the forms and adequately tied and braced.
  - 5. The entire place of deposit shall have been cleaned of wood chips, sawdust, dirt, debris, hardened concrete and other foreign matter. No wooden ties or blocking shall be left in the concrete except where indicated for attachment of other work.
  - 6. Reinforcing steel, at the time the concrete is placed around it, shall be cleaned of scale, mill scale or other contaminants that will destroy or reduce bond.
  - 7. Concrete surfaces to which fresh concrete is to be bonded shall be brush cleaned to remove all dust and foreign matter and to expose the aggregate, and then coated with the bonding adhesive herein specified.
  - 8. Prior to placing concrete for any slabs on grade, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.
  - 9. No concrete shall be placed until formwork and reinforcement has been approved by Architect. Clean forms of all debris and remove standing water. Thoroughly clean reinforcement and all handling equipment for mixing and transporting concrete. Concrete shall not be placed against reinforcing steel that is hot to the touch. Notify Architect 48 hours in advance of concrete pour.
- B. Conveying: Handle concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Deposit concrete in forms as nearly as practicable at its final position in a manner which will insure that required quality is obtained. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- C. Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness around building, proceeding along forms at a uniform rate and consolidating into previous pour. In no case shall concrete be poured into an accumulation of water ahead of pour, nor shall concrete be flowed along forms to its final place of deposit. Fresh concrete shall not be permitted to fall from a height greater than 6 feet without use of adjustable length pipes or, in narrow walls, of adjustable flexible hose sleeves. Concrete shall be scheduled so that placing is a continuous operation for the completion of each section between

predetermined construction joints. If any concreting operation, once planned, cannot be carried on in a continuous operation, concreting shall stop at temporary bulkheads, located where resulting construction joints will least impair the strength of the structure. Location of construction joints shall be as shown on the drawings or as approved by Structural Engineer. The rate of rise in walls shall not be less than 2 feet per hour.

1. Consolidation: Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing. Power vibrators of approved type shall be used immediately following pour. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by Structural Engineer. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete. Provide and maintain standby vibrators, ready for immediate use.
  2. Hot Weather Concreting: Unless otherwise directed by the Architect, perform all work in accordance with ACI 305 when air temperature rises above 75 degrees F and the following:
    - a. Mixing Water: Keep water temperature as low as necessary to provide for the required concrete temperature at time of placing. Ice may be required to provide for the design temperature.  
Aggregate: Keep aggregate piles continuously moist by sprinkling with water.  
Temperature of Concrete: The temperature of the concrete mix at the time it is being placed in the forms shall not exceed 85 degrees F. The method employed to provide this temperature shall in no way alter or endanger the design mix or the design strength required.  
Dampen subgrade and formwork before placing concrete. Remove all excess water before placing concrete. Keep concrete continuously wet when air temperature exceeds 85 degrees F for a minimum of 48 hours after placing concrete.  
Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection in place for 14 days minimum.
  3. Cold Weather Concreting: Follow recommended ACI 306 procedures when air temperature falls below 40 degrees F., as approved by Architect. Concrete placed in freezing temperatures shall have a temperature of not less than 50 degrees F. Maintain this temperature for at least 7 days. No chemicals or salts shall be used to prevent freezing and no accelerating agents shall be used without prior approval from Architect.
- D. Construction Joints: Install only as indicated and noted on Drawings. Joints not indicated on Drawings shall be so located, when approved, as to least impair strength of structure, and shall conform to typical details. Construction joints shall have level tops, vertical sides. Horizontal construction joints shall be thoroughly cleaned and roughened by removing entire surface film and exposing clean aggregate solidly embedded in mortar matrix. Joints between concrete and masonry shall be considered construction joints. Vertical construction joints need not be roughened. See Drawings for doweling and required keys.
1. Roughen construction joints by any of following methods:
    - a. By sandblasting joint.
    - b. By thoroughly washing joint, using a high pressure hose, after concrete has taken initial set. Washing shall be done not less than 2 hours nor more than 4 hours after concrete has been poured, depending upon setting time.
    - c. By chipping and wire brushing.
  2. All decisions pertaining to adequacy of construction joint surfaces and to compliance with requirements pertaining to construction joints shall be reviewed with the Structural Engineer.
  3. Just before starting new pour, horizontal and vertical joint surfaces shall be dampened (but not saturated).
  4. Before placing regular concrete mix, horizontal construction joint surfaces shall be covered with a layer of mortar composed of cement and fine aggregate of same proportions as that used in prescribed mix, but omitting coarse aggregate.

- E. Concrete Slabs on Grade:
1. Exterior concrete slabs on grade shall be poured as required under this Section. Base shall be accurately leveled and compacted prior to placing of concrete.
  2. Typically, interior slabs on grade shall be poured over a vapor barrier and over a minimum of four (4 inch) inches, unless otherwise indicated, of compacted crushed rock.
  3. If sand is indicated on the structural drawings, place over the vapor barrier, otherwise, provide no sand layer.
  4. Vapor Retarder installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
    - a. Unroll Vapor Retarder with the longest dimension parallel with the direction of the pour.
    - b. Lap Vapor Retarder over footings and seal to foundation walls.
    - c. Overlap joints 6 inches and seal with specified tape.
    - d. Seal all penetrations (including pipes) per manufacturer's instructions.
    - e. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.
    - f. Repair damaged areas by cutting patches of Vapor Retarder, overlapping damaged area 6 inches and taping all four sides with tape.
- F. Control Jointing - Slabs on Grade:
1. Joints shall be in locations indicated on Drawings, or as directed by Architect.
  2. Joints in interior slabs shall be made by one of following methods:
    - a. By use of construction joints laid out in checkerboard pattern; pour and allow alternate slabs to set; fill out balance of checkerboard pattern with second pour.
    - b. By use of dummy groove joints at least 1/4 depth of slab, and at least 1/8 inch wide. These joints may be sawcut as soon as wet concrete can support the weight of the equipment and operator. Delaying sawcutting past this point will make jointing ineffective.
  3. Control jointing in exterior paving slabs shall be poured in a checkerboard pattern as described above, but with joint edges tooled to provide a uniform joint at least 3/8 inch in depth.
  4. Slab reinforcing need not be terminated at control joints.
  5. Construction and expansion joints shall be counted as control joints.
- G. Expansion Joints - Slabs on Grade:
1. Unless otherwise indicated, use 3/8 inch thick expansion joint filler. See Section 2.1.G
  2. Joints in interior slabs on grade shall be in locations indicated, or, where not indicated, locate joints at uniformly spaced intervals not exceeding 100 feet.
  3. Joints in exterior slabs on grade shall be installed at each side of structures, at curb transitions opposite apron joints, at ends of curb returns, at back of curb when adjacent to sidewalk, and at uniformly spaced intervals not exceeding 20 feet.
  4. Edges of concrete at joints shall be edger finished to approximately 3/8 inch radius.
  5. Interrupt reinforcing at all expansion joints.
- H. Score markings on exterior slabs on grade shall be located as indicated. Where not indicated, mark slabs into rectangles of not less than 12 square feet nor more than 20 square feet using a scoring tool which will leave edges of score markings rounded.

### 3.2 CURING AND PROTECTION

- A. Curing: Exposed surfaces of all concrete used in structure shall be maintained in a moist condition for at least 7 days after placing. The following final curing processes shall normally be considered to accomplish this. Concrete shall be maintained at not less than 50 degrees F nor more than 100 degrees F for a period of 72 hours after being deposited.

1. Flatwork to be exposed, stained, or painted shall have curing process submitted and approved by the architect prior to construction.
  2. Initial Curing Process - Flat Work:
    - a. Mist Spraying: As soon as troweling of concrete surfaces is completed, exposed concrete shall be sprayed continuously with a special atomizer spray nozzle, capable of producing a fine mist. Spraying shall be done without any dripping of water from nozzle. Amount of spraying shall be such as to maintain surface of concrete moist without any water accumulating on surface. Maintain spraying for a minimum of 12 hours, or until such time as hereinafter described curing process is applied. Mist spraying will not normally be required when the ambient air temperature is below 90 degrees F.
  3. Final Curing Process - Flatwork: Except as noted, use any of following:
    - a. Water Curing: Concrete shall be kept wet by mechanical sprinklers or by any other approved method which will keep surfaces continuously wet.
    - b. Saturated Burlap Curing: Finished surfaces shall be covered with a minimum of two layers of heavy burlap which shall be kept saturated during the curing period.
    - c. Curing Compounds: Membrane curing compounds of chlorinated rubber or resin type conforming to ASTM C309 may be used only if specifically approved by Architect. Use of membrane curing compound will not be permitted on surfaces to be painted, or to receive ceramic tile, membrane water-proofing or hardeners and sealers. Membrane curing compound may be used in areas to receive resilient floor tile, provided it is wax-free, compatible with adhesive used and approved by adhesive manufacturer. Agitate curing compounds thoroughly by mechanical means continuously during use and spray or brush uniformly in accordance with manufacturer's recommendations. Apply immediately following final finishing operation. All curing compounds shall conform to State of California Air Resources Board VOC Regulations.
    - d. Waterproof paper conforming to ASTM C 171, or opaque polyethylene film, may be used. Concrete shall be covered immediately following final finishing operation. Anchor paper or film securely and seal all edges in such a manner as to prevent moisture escaping from concrete.
  4. Curing Process - Formed Surfaces: Forms heated by sun shall be kept moist during curing period. If forms are to be removed during curing period, curing as described for flatwork shall be commenced immediately.
- B. Refer to Drawings for areas of concrete slab not to receive curing compounds or hardening compounds. Where concrete floors are to receive heavy duty coatings, waterproof coatings and the like, verify with coating installer the type of finish required for specified coating.
- C. Protection: Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.
- D. Provide additional curing agents or compounds, not necessarily listed herein, but as recommended and or required for use with shake type hardeners or other special coatings and coverings by their manufacturers for a complete and proper installation.

### 3.3 FINISHES

- A. Formed Surfaces:
1. Rough Form Finish: Surfaces shall be reasonably true to line and plane with no specified requirements for selected facing materials. Tie holes and defects shall be patched and fins exceeding 1/4 inch in height shall be rubbed down with wooden blocks. Fins and other rough spots at surfaces to receive membrane waterproofing shall be completely removed and the surfaces rubbed smooth. Otherwise, surfaces shall be left with the texture imparted by forms.

- a. Rough finish shall be used for the following areas:
    - 1) Below grade and unexposed surfaces.
  2. Smooth Plywood Form Finish: Finish shall be true to line and plane. Tie holes and defects shall have been patched and ground with surface fins removed. Arrangement of plywood sheets shall be orderly, symmetrical, as large as practical and free of torn grain or worn edges. Surface concrete shall be treated with 1 part muriatic acid, in three parts water solution, followed immediately by a thorough rinsing with clear water. Surfaces which are glazed, have efflorescence, or traces of form oil, curing compounds or parting compounds shall be cleaned or treated to match other formed surfaces, except as otherwise indicated or specified.
    - a. Smooth Plywood Form Finish shall be used for the following areas:
      - 1) All surfaces above grade unless otherwise specified.
      - 2) At Contractor's option, may also be used in lieu of rough form finish.
  3. Smooth Plastic Liner Finish: Surface shall be smooth, concrete free of honeycombing, air pockets larger than 1/8 inch in diameter, and fins.
    - a. This finish shall be used only where indicated on the Drawings.
- B. Flatwork:
1. Unless otherwise indicated or specified, flatwork shall have an integral monolithic finish.
  2. Integral Monolithic Finish: Apply as soon as freshly poured concrete slabs will bear weight of workers. Pour slabs full thickness to finish floor elevations indicated. At proper time, tamp surface repeatedly with a wire mesh or grid tamper in a manner to force aggregate down below surface and to bring sufficient mortar to surface to provide for a smooth coating of cement mortar over entire surface. Allow surface mortar to partially set, then float with wooden floats and finish with one of following, as required.
    - a. Broom Finish: Steel trowel surface to a smooth dense surface free of lines, tool marks, cat faces and other imperfections. After troweling, and before final set, give surface a broom finish, brushing in direction noted on Drawings, or as directed. Broom finish shall be used typically on exterior flatwork except as otherwise indicated or specified and shall be "medium" texture as approved by Architect.
    - b. Smooth Steel Trowel Finish: Apply 2 steel trowelings to obtain hard, smooth surface. All lips, irregularities, uneven levels, etc. shall be worked out before last troweling. All interior flatwork shall have a smooth steel trowel finish unless specified otherwise.
  3. Tolerances:
    - a. For tolerances not indicated, refer to ACI 117.
    - b. Finished surfaces of all interior integral finished flatwork shall be sufficiently even to contact a 10' long straightedge with a tolerance of 1/8 inch.
    - c. Finished surfaces of exterior integral finished flatwork shall not vary more than 1/4 inch from a 10' long straightedge, except at grade changes.
- C. Sacked Surfaces: Exposed surfaces that are unacceptable in appearance to the Architect shall be sacked.
1. Prepare concrete surfaces in accordance with the referenced standards. Remove any form release materials by stoning by hand, power grinding or other method approved by the Architect.
  2. Prepare concrete surfaces to receive sack finishing with a light sand blasting.
  3. For best results, grout application and rubbing should be performed when areas to be treated are shaded and during cool, damp weather. When work is to be performed in hot and dry weather, a fog spray should be available for continuous use.
  4. Prepare grout samples for matching of concrete surfaces for approval by the Architect. These shall be made in the following proportions of gray cement to white cement to sand: 1:1:2, 1:2:3, and 2:1:3, etc. until the correct matching color is obtained on the test areas. Sand should be fine enough to pass the Number 30 sieve. Mixes should be made to a good workable consistency in a clean container and the mix with the best color chosen, or modified if needed.

5. Provide sufficient quantities of sand and cement from the same source for the complete work at the job site.
6. Mixing and Application:
  - a. Mixing of grout on the job should be timed for it to be used up within 1 to 1-1/2 hours.
  - b. Let the grout stand 20 to 30 minutes after mixing, and then remixed before applying.
  - c. Soak the concrete surface thoroughly with water at least 15 minutes before applying grout and again just before application so that the surface is adequately wet during the operation.
  - d. Apply grout with plasterer's trowel or sponge rubber float in sweeping strokes from the bottom up. Brush or spray gun applications may be used when approved by the Architect.
  - e. Work in freshly applied grout vigorously with a sponge rubber float, then let sit until some of its plasticity is gone but not until it loses its damp appearance. At this point it shall be rubbed with clean, dry burlap to remove the excess grout, leaving no visible film on the surface but filling all air holes.
  - f. Keep the surface wet for a day after grouting and sack rubbing are completed.
7. Alternate methods of application and materials shall be subject to the approval of the Architect.

### 3.4 PATCHING

#### A. Formed Surfaces:

1. Promptly upon removal of contact forms and after concrete surfaces have been inspected, form ties shall be removed and all necessary patching and pointing shall be expertly done.
2. Honeycombed areas shall be removed down to sound concrete, coated with a bonding grout or approved compound and patched using a low shrinkage high bond mortar. Patched areas shall be cured by being kept damp for at least 5 days.
3. Tie holes shall be cleaned, dampened and filled solid with patching mortar or cement plugs of an approved variety.

#### B. Slabs on Grade: After entire slab is finished, shrinkage cracks that may appear shall be patched as follows:

1. Where slab is not exposed or where appearance is not important, cracks larger than 1/32 inch wide shall be filled with cement grout and struck off level with surface.
2. Where slab is exposed and appearance is important, unsightly cracks shall be repaired in a manner satisfactory in appearance to Architect. If this cannot be accomplished, concrete shall be considered defective.

### 3.5 DEFECTIVE CONCRETE

#### A. Defective concrete shall mean any of the following:

1. Concrete not meeting 100 percent of the specified 28 day compressive strength.
2. Concrete exhibiting rock pockets, voids, spalls, streaks, cracks, exposed reinforcing to extent that strength, durability, or appearance is adversely affected.
3. Concrete significantly out of place, line, or level.
4. Concrete not containing the required embedded items.

#### B. Upon determination that concrete strength is defective:

1. Should cylinder tests fall below minimum strength specified, concrete mix for remainder of work shall be adjusted to produce required strength. Core samples shall be taken and tested from cast-in-place concrete where cylinders and samples indicate inferior concrete with less than minimum specified strength.
  - a. Cores of hardened concrete shall be taken and tested in accordance with ASTM C 42 and C 39. Number and location of such cores shall be subject to the approval of Architect.

- b. Cost of core sampling and testing will be paid for by the Contractor.
  - c. "500 psi" and "85 percent" reduction in ACI 318 5.6.5.4 will not justify low cylinder tests.
- C. Upon determining that concrete surface is defective, Contractor may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure. Permission to patch defective areas will not be considered a waiver of the right to require removal if patching does not, in the opinion of the Architect, satisfactorily restore quality and appearance.
- D. If core tests indicate that concrete is below the strength specified, or if patching does not restore concrete to specified quality and appearance, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the Owner.
- E. No repair work shall begin until procedure has been reviewed by the Architect and Structural Engineer.

### 3.6 SURFACE HARDENER AND SEALER

- A. Seal all interior exposed flatwork with clear sealer, except surfaces receiving ceramic tile, quarry tile, poured flooring or other special finishes specified, or as scheduled on the Drawings.
- 1. Apply sealer in 2 or 3 coats, in accordance with manufacturer's directions, using the maximum quantity recommended.
    - a. Concrete floors must be thoroughly cured for a minimum of 30 days and completely dry before treatment.
    - b. Surfaces to be treated must be clean, free of membrane curing compounds, dust, oil, grease and other foreign matter.
    - c. Upon completion, concrete surfaces shall be clean and without discoloration or traces of excess hardener left on the surface.
- B. Apply sprayable hardener/sealer at locations as scheduled or as indicated on the Drawings. Apply in accordance with the manufacturer's favorably reviewed application instructions and recommendations.

### 3.7 GROUTING

- A. Prepare and place grout materials at locations as indicated on the Drawings in accordance with the manufacturer's recommendations and installation instructions.
- B. Pack grout materials solidly between bearing surfaces and bases or plates as indicated and to ensure no voids.

### 3.8 ADJUSTING AND CLEANING

- A. Remove all debris, excess materials, tools and equipment resulting from or used in this operation at completion of this work.

END OF SECTION 03 30 00



**PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS**

A. The requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

A. Provide all materials, labor and accessories as required and specified for complete mortar and grout installation in masonry walls.

**1.3 RELATED WORK (See also Table of Contents):**

A. Cast-In-Place Concrete: Section 03 30 00.

B. Concrete Unit Masonry: Section 04 22 00.

C. Reinforcing Steel: Section 03 21 00.

**1.4 QUALITY ASSURANCE**

A. Standards and References: (Latest Edition unless otherwise noted)

1. ASTM C144, Aggregate for Masonry Mortar.
2. ASTM C150, Portland Cement.
3. ASTM C207, Hydrated Lime for Masonry Purposes
4. ASTM C270, Standard Specification for Mortar for Unit Masonry
5. ASTM C404, Aggregates for Grout
6. ASTM C476, Standard Specification for Grout for Masonry
7. ASTM C1019, Method of Sampling and Testing Grout
8. CBC Section 2103
9. 2010 California Building (CBC)
10. Masonry Standards Joint Committee (MSJC)

B. Tests and Inspections:

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2010 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
2. All tests and inspections herein are to be performed by the Owner or an independent testing laboratory approved by the building official.
3. Mortar and Grout Tests: If mortar and grout tests are indicated as required on the Structural drawings, at the beginning of Masonry Work, at least 1 test sample each of mortar and grout shall be taken on 3 successive working days, then once per week with at least one sample taken for each 5000 square feet of wall area, or fraction thereof.
  - a. Test specimens shall be made in accordance with ASTM C1019 for grout and ASTM C780 for mortar.
  - b. Test specimens shall be continuously stored in moist air until tested.
  - c. Mortar shall show a compressive strength of not less than 1800 psi at 28 days. Grout shall show a compressive strength of not less than 2000 psi at 28 days.
4. If masonry placement and grouting inspection is indicated as required on the Structural Drawings, a special inspector shall be employed per CBC Section 1704 during the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.

- C. Submittals:
  - 1. Mix design for mortar and grout shall be submitted for review.
  - 2. Supplier's certificates indicating materials comply with the specifications below. They shall include but are not necessarily limited to:
    - a. Aggregates
    - b. Cement
    - c. Admixtures

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Cement: ASTM C 150, Type I or II, low alkali; natural gray.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Quicklime: ASTM C 5.
- D. Lime Putty: Made from hydrated lime or quicklime.
  - 1. If made from quicklime, other than processed pulverized quicklime, slake lime and then screen through a No. 16 mesh sieve. Before using, store and protect slaked and screened lime putty for not less than 10 days.
  - 2. Processed pulverized quicklime shall be slaked for not less than 48 hours, and shall be cool when used.
  - 3. Lime putty prepared from hydrated lime may be used immediately after mixing.
  - 4. Lime putty prepared from quicklime or pulverized quicklime shall have a plasticity figure, after slaking and screening, of not less than 200, and shall weigh not less than 83 lbs. per cubic foot. Lime putty prepared from hydrated lime shall conform to ASTM C 207, Type S.
- E. Aggregate:
  - 1. For Mortar: ASTM C144.
  - 2. For Grout: ASTM C404.
- F. Admixture: "Sika Grout Aid"
- G. Water: Suitable for domestic consumption.

**2.2 MORTAR**

- A. Mortar shall be Type S having a 28 day compressive strength of not less than 1800 psi, and shall conform to CBC Section 2103.
- B. Mortar shall be made with admixtures that are proportioned, added and mixed in strict accordance with manufacturer's directions.
- C. Mortar mix shall be proportioned by volume; one part portland cement, not less than 1/4 part nor more than 1/2 part lime putty, and sand totaling not less than 2-1/4 nor more than 3 times sum of volumes of cement and lime used.
  - 1. Total clay content shall not exceed 2% of sand content or 6% of cement content.

**2.3 GROUT**

- A. Grout shall have a 28-day compressive strength of not less than 2000 psi. Proportion by volume, and with sufficient water to produce consistency for pouring without segregation so that grout will flow into masonry joints. Grout shall conform to CBC Section 2103.
- B. Fine Grout: 1 part portland cement, to which may be added not more than 1/10 part lime putty, and 3 parts sand.

1. Fine grout shall be used for all grout spaces less than 3" wide.
- C. Coarse Grout: 1 part portland cement, to which may be added not more than 1/10 part lime putty, 3 parts sand and not less than 1 part nor more than 2 parts pea gravel (3/8" maximum aggregate size).
  1. Coarse grout shall be used in grout spaces 3" wide or more.
- D. Add "Sika Grout Aid" admixture to grout at the rate of 1 pound per 100 pounds cementitious material.

**PART 3 - EXECUTION****3.1 MIXING MORTAR AND GROUT**

- A. Accurately measure materials in suitably calibrated devices; shovel measurements are not acceptable. Each 94lb. sack of portland cement will be considered as 1 cubic foot.
- B. Place sand, cement and water in mixer in that order and mix for at least 2 minutes; then add lime putty and continue mixing as long as necessary to secure a uniform mass, but in no case less than 10 minutes.
- C. Use mixers of at least 1 sack capacity; batches requiring fractional sacks will not be permitted unless cement is weighed for each batch.

**3.2 GROUTING PROCEDURES**

- A. Specified under Section 04 22 00.

**3.3 RETEMPERING**

- A. When necessary to retemper mortar, add water and remix; retempering by dashing water over mortar will not be permitted.
- B. Any mortar which is unused within 30 minutes after initial mixing and any mortar that has begun to set shall not be used.

**3.4 DEFECTIVE MORTAR OR GROUT**

- A. Should the strength of mortar or grout fall below that specified, remainder of Work shall be adjusted to reach required strength. Work in place representing inferior grout and mortar and indicating a strength less than the minimum specified shall be tested by taking and testing core samples. Number and location of cores shall be determined by Structural Engineer.
- B. Should compression tests of cores fail to meet required strength, masonry shall be deemed to be defective and shall be removed and replaced at no cost to Owner.
- C. Costs relative to taking and testing of core samples and patching core holes associated with defective mortar or grout, shall be borne by the Contractor.

END OF SECTION 04 05 00

**PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS**

A The requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

A. Furnish and install all concrete unit masonry, reinforcement, and all required accessories and materials as shown on the Drawings and specified here.

1. Cooperate with other trades for embedded items, furnished under those sections and installed here.
2. Supervise setting of dowels for masonry furnished and installed under Section 03 21 00, Reinforcing Steel.

**1.3 RELATED WORK (See also Table of Contents):**

- A. Reinforcing Steel: Section 03 21 00.
- B. Cast-in-Place Concrete: Section 03 30 00.
- C. Mortar and Grout: Section 04 05 00.
- D. Miscellaneous Metal: Section 05 50 00.

**1.4 QUALITY ASSURANCE**

A. Allowable Tolerances: Maximum deviation from indicated line or plane of installed concrete masonry units shall not exceed 1/8 inch in 10 feet in any direction.

B. Standards and References: (Latest Edition unless otherwise noted):

1. 2010 California Building Code (CBC)
2. ASTM C90 - Hollow and Solid Load Bearing Concrete Masonry Units
3. ASTM C140 - Sampling and Testing of Concrete Masonry Units
4. ASTM C426 - Standard Test Method for Drying Shrinkage Concrete Block.
5. CBC Section 2103.1.
6. Concrete Masonry Design Manual published for the Concrete Masonry Association of California and Nevada, current Edition.
7. Masonry Standards Joint Committee (MSJC)

C. Submittals: Refer to Section 01 33 00 for submitting the following items:

1. Suppliers certificate indicating units comply with material standards indicated below:
2. See Section 03 21 00 for reinforcing steel submittals.

D. Tests and Inspections:

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2010 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
2. All tests and inspections herein are to be performed by an independent testing laboratory approved by the Building Official.
3. If masonry tests are indicated as required on the structural drawings, three sample units will be tested during construction for each 5,000 square feet of wall area. Test also three sample units prior to construction.

- a. Units will be tested for compressive strength on both the net and gross area per ASTM C140.
- b. Units will be tested for linear drying shrinkage per ASTM C426.
4. If masonry placement and grouting inspection is indicated as required on the structural drawings, a special inspector shall be employed per CBC Section 1704 to inspect the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.
5. See Section 03 21 00 for reinforcing steel tests and inspections.

#### 1.5 PRODUCT HANDLING

- A. Scaffolding, runways and ladders required for work under this Section shall be provided by masonry contractor, and shall be heavy trades type substantially built and in compliance with State labor laws, safety codes and other regulatory agencies as applicable to this project.
- B. Environmental Requirements: Install concrete unit masonry when temperature in area surrounding work is 40° F or above. Maintain temperature of work above 40° F for at least 48 hours after installation. Grout shall not be placed when air temperatures fall below 20° F.
- C. Store masonry units off the ground in a dry location, covered and protected from absorbing moisture.

### PART 2 - PRODUCTS

#### 2.1 MASONRY UNITS

- A. Masonry units shall be hollow load bearing masonry units conforming to ASTM C90 and CBC Section 2103.1.
  1. Weight: Light weight.
  2. Maximum lineal shrinkage from saturated to oven dry condition of not more than 0.065 percent.
  3. Twenty-eight day compressive strength of 1000 psi on gross area and 1900 psi on net area.
  4. Moisture controlled units.
- B. Unit Type
  1. 8" wide by 8" high x 16" long unless specified otherwise.
- C. Provide bond beam units, open end units and other special units as indicated. Use open end units at cells containing vertical reinforcement wherever possible.

#### 2.2 MORTAR AND GROUT

- A. Specified under Section 04 05 00.

#### 2.3 ACCESSORY MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 40 or 60, as indicated in Section 03 21 00, deformed bars.
  1. Tie Wire: Black annealed steel wire not lighter than 16 gage.
- B. Provide spacers to firmly hold reinforcement in place.
- C. Anchor Bolts: All anchor bolts cast in masonry shall be headed bolts with cut threads conforming to ASTM A307 or ASTM A36 or ASTM A572.50 as indicated on drawings.

- D. Expansion Anchors: All expansion bolts installed in masonry shall be Hilti Kwik Bolt 3 as manufactured by Hilti Inc. See Structural Drawings for installation requirements and tension testing requirements as applicable. See Drawings for special head requirements as needed. Substitution of other brands or anchors shall proceed only after written approval from the Structural Engineer and the Building Official as been obtained.

## 2.4 JOINTS

- A. All joints shall be 3/8" thick joints for concrete block, Tool exposed interior and exterior joints and concealed exterior joints to produce a dense slightly concave surface that is well bonded to unit at edges. Tool joints behind room base, switches, and outlet plates to produce a smooth dense joint flush with the face of adjacent masonry units, where occurring on the job. Cut joints flush on concealed interior surfaces and surfaces to be plastered.

## 2.5 SEALER

- A. Contractor shall provide and install minimum two coats, Thoroseal masonry sealer at all CMU walls. Thoroseal product shall meet all state vapor requirements. Sealer shall be clear and non-gloss product.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive masonry and verify following:
  - 1. That foundation surface is level to permit bed joint with range of 1/4 to 3/4 inch.
  - 2. That edge is true to line to permit projection of masonry to less than 1/4-inch.
  - 3. That projecting dowels are free from loose scale, dirt, concrete, or other bond-inhibiting substances and properly located.
- B. Do not begin work before unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean concrete surfaces to receive masonry. Remove latence or other foreign material lodged in surfaces by sandblasting or other means as required. Joints between concrete and masonry shall be considered construction joints. See Concrete specifications.
- B. Ensure masonry units are clean and free from dust, dirt, or other foreign materials before laying.
- C. Establish lines, levels, and coursing. Protect from disturbances.
- D. Provide temporary bracing during erection of masonry work. Maintain in place until masonry has set to provide permanent bracing.

### 3.3 COURSING

- A. Erect masonry in accordance with CBC Section 2104.1.2.
- B. Place masonry to lines and levels indicated to the following tolerances:
  - 1. Variation from Unit to Adjacent Unit: 1/32-inch max.
  - 2. Variation from Plane of Wall: 1/4-inch in 10 feet.
  - 3. Variation from Plumb: 1/4-inch.
  - 4. Variation from Level Coursing: 1/8-inch in 3 feet; 1/4-inch in 10 feet; 1/2-inch maximum.
  - 5. Variation of Joint Thickness: 1/8-inch in 3 feet.

- C. Bond: Unless noted otherwise in Drawings, lay concrete masonry units in running bond with vertical joints located over score of unit in course below (and vice versa).
- D. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- E. Preserve the vertical continuity of cells in concrete unit masonry. The minimum clear horizontal dimensions of vertical cores shall be 3 x 3 inches for 8-inch wide block.

### 3.4 PLACING AND BONDING

- A. Do not install cracked, broken or chipped masonry units.
- B. Lay only dry concrete masonry units.
- C. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
  - 1. Block Cap: Lay with full mortar coverage on horizontal and vertical joints.
  - 2. Install grout cap where and as indicated.
- D. Fully bond intersections and external and internal corners.
- E. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- F. Remove excess mortar.
- G. Perform job-site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- H. Step back unfinished work for joining with new work. Do not use toothing.

### 3.5 JOINTS

- A. Horizontal and vertical joints at masonry units shall be 3/8-inch wide and as follows:
  - 1. Point joint tight in unpurged masonry below ground.
  - 2. All end joints shall be fully filled with mortar and joints squeezed in bed joints shall be held back approximately 1/2-inch from cell to provide positive bond with grout.
  - 3. Joints shall be struck flush at all areas to receive plaster finish.

### 3.6 MASONRY REINFORCEMENT

- A. Place reinforcement in accordance with ACI 315, to a tolerance of +/- 1/2-inch from specified location.
- B. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of bars for bending will not be permitted.
  - 1. Bars shall conform accurately to the sizes, shapes, lines and dimensions shown on drawings and with hooks and beds made as detailed. Bars shall be placed as indicated on the drawings and centered on grout space.
  - 2. At the time grout is place around it, reinforcing steel shall be clean of mill scale or other coatings that will destroy or reduce bond.
  - 3. All vertical reinforcing steel shall be installed in one piece, full height of wall, and braced throughout its height in a manner that will retain the steel in proper position and provide the proper clearance.
- C. Reinforcing steel shall be secured to all foundation dowels and held in place at spacings not to exceed 192 bar diameters.

## 3.7 GROUTING

## A. General Requirements:

1. All cells shall be grouted solid.
2. Use low lift or high lift grouting at Contractor's option.
3. Use grout pump, hopper or bucket to place grout.
4. Place grout in final position within 1-1/2 hours after introduction of mixing water.
5. Place grout and rod with a 3/4-inch flexible cable vibrator sufficiently to cause it to flow into all voids between the cells and around the reinforcing steel. Slushing with mortar will not be permitted.
6. Stop grout approximately 1½ inches below top of last course; except at top course bring grout to top of wall.

## B. Low Lift Grouting:

1. Do not lay units higher than 48 inches before grouting.
2. If mortar has been allowed to set prior to grouting, remove all fins protruding more than ½-inch into grout space.
3. Conform to requirements of CBC Section 2104.6.1.1.2.
4. Consolidate each lift twice. Once while placing grout and once more after initial absorption of water but before set.

## C. High Lift Grouting:

1. Conform to requirements of CBC Section 2104.6.1.1.3.
2. Lay up walls, subject to maximum height limitations of Masonry Standards Joint Committee, Building Code Requirements for Masonry Structures Table 1.16.1.
3. Provide clean out holes at the bottom of every pour in cells containing vertical reinforcement. Construct clean out courses with open-bottom bond beam units inverted to permit cleaning of all cells by flushing. Cleanouts shall be not less than 3x4inch openings cut from one face shell. Do not plug clean out holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected.
4. Clean mortar droppings from the bottom of the grout space and from reinforcing steel. Remove mortar fins protruding more than ½-inch into the grout space by dislodging the projections with a rod or stick as the work progresses or by washing the grout space at least twice a day during erection using a high pressure stream of water.
5. Do not place grout in hollow unit masonry until mortar joints have set for at least 72 hours and clean out plugs have cured 48 hours.
6. Place grout in lifts not to exceed 4 feet in height, with a waiting period between lifts, dependent on weather and absorption rate of the masonry, in order to place the succeeding lift after the preceding lift becomes plastic but prior to initial set. The first lift shall be consolidated using mechanical vibrators. After the required waiting period, place the second lift and consolidate with the vibrator, reconsolidating the lift below to a depth of 12 to 18 inches. Repeat the waiting, placing and consolidating process until the top of the grout pour is reached. Reconsolidate the top lift after the required waiting period. The high-lift grouting of any section of wall between lateral flow barriers shall be completed to the top of a pour in one working day unless a new series of clean out holes is established and the resulting horizontal construction joint cleaned.

## 3.8 WEATHER PROVISIONS FOR CONSTRUCTION

- A. Cold Weather Construction to be in accordance with CBC section 2104.3.
- B. Hot Weather Construction to be in accordance with CBC section 2104.4

## 3.9 EXPANSION JOINTS

- A. See drawings for type and location of expansion joints.



**3.10 BOND BEAMS**

- A. Bond beams shall be located where shown and detailed on the drawings, and shall be reinforced as indicated and as herein after specified.

**3.11 BUILT-IN WORK**

- A. Miscellaneous Embedded Items: All items indicated to be embedded in masonry shall be carefully located and anchored to prevent movement during grouting operations. Avoid cutting and patching.
  - 1. Install all anchor bolts and anchors furnished under other sections for wood nailers, ledgers, etc.

**3.12 CUTTING AND FITTING**

- A. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

**3.13 REPAIR, POINTING AND CLEANING**

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damage, or if units do not match adjoining units.
- B. Pointing: During the tooling of joints, enlarge any voids or holes and completely fill with mortar.
- C. Dry brush masonry surface after mortar has set, at each day's work and after final pointing.
- D. Leave work and surrounding surface clean and free of mortar spots and droppings.
- E. Cleaning: Upon completion of masonry installation, repair all holes. Defective joints shall be cut out and rejointed. Exposed masonry surfaces shall be cleaned free of mortar, green stain and efflorescence.

**3.14 SEALER**

- A. Contractor shall install sealer as directed by the manufacturer. Coverage and installation rates shall be as per manufacturer's recommendations. Install sealer in minimum two coats at the rates required.

**3.15 DEFECTIVE MASONRY**

- A. Materials or workmanship not conforming to appearance or strength specified, will be deemed defective and shall be removed and replaced at no cost to Owner.
- B. Defective mortar and grout, as defined under Section 04 05 00; "Mortar and Grout" shall constitute defective masonry.

END OF SECTION 04 22 00

## PART 1 - GENERAL

## 1.1 GENERAL REQUIREMENTS

- A. Requirements of Division 1 apply to all Work of this Section.

## 1.2 SCOPE

- A. Furnish and install all structural steel as shown and specified including, but not necessarily limited to the following:
  - 1. Prime coat painting and touch up.
  - 2. All cast-in-place anchor bolts, nuts, plates, etc.
  - 3. 10 gauge steel or 3/4 inch plywood templates for column anchor bolts.

## 1.3 RELATED WORK (See also Table of Contents)

- A. Metal Fabrications: Section 05 50 00.
- B. Cast-In-Place Concrete: Section 03 30 00.
- C. Metal Stairs: Section 05 51 00.

## 1.4 QUALITY ASSURANCE

- A. General:
  - 1. Comply with the referenced ASTM standards for materials.
  - 2. Perform all welding only with AWS certified welders.
  - 3. Verification of accuracy:
    - a. Engage and pay for a registered civil engineer or licensed land surveyor to check the alignment, plumbness, elevation, and overall accuracy of the erected framing at appropriate stages during construction and at completion of erection. He shall submit written verification that the entire installation is in accordance with the contract documents.
    - b. Columns shall be verified at each lift. Column shim details and procedures shall be submitted for review.
  - 4. Paint:
    - a. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use thinners approved by paint manufacturer, and use within recommend limits.
    - b. Coordination of Work: Review other Sections in which prime paints are to be provided to ensure compatibility of coatings system for various substrates. Upon request, furnish information or characteristics of finish materials to be used.
    - c. Requirements of Regulatory Agencies: Comply with applicable rules and regulations of governing agencies for air quality control.
- B. Except where other requirements are specified, comply with the following standards by American Institute of Steel Construction (AISC) and American Welding Association (AWS):
  - 1. AISC 360-05 "Specification for Structural Steel Buildings".
  - 2. 2005 AISC "Code of Standard Practice for Steel Buildings and Bridges".
  - 3. AISC 341-05 "Seismic Provisions for Structural Steel Buildings"
  - 4. AISC 358-05 "Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications"

5. AISC "Specifications for Structural Joints Using A325 or A490 Bolts".
  6. 2005 AISC Section 10, Architecturally Exposed Structural Steel, Code of Standard Practice for Steel Buildings and Bridges
  7. AWS D1.1 "Structural Welding Code".
  8. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
  9. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures
  10. SSPC-SP2 Hand Tool Cleaning
  11. SSPC-SP3 Power Tool Cleaning
  12. SSPC-SP6 Commercial Blast Cleaning
  13. SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gauges
  14. 2006 International Building Code (IBC).
- C. Submittals: (Submit under provisions of Section 01 33 00)
1. Product Data: Include laboratory test reports and other data to show compliance with specifications (include specified standards). Include certified copies of mill reports covering chemical and physical properties of each type of structural steel.
  2. Shop Drawings:
    - a. Shop drawings shall include complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
    - b. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
    - c. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.
    - d. Dimensions required to locate structural steel for manufactured items such as mechanical equipment, electrical equipment, dock levelers, etc., shall be coordinated and provided by the General Contractor. General Contractor shall also coordinate and provide dimensions to locate structural steel for window washing supports such as davits, tie-backs, etc.
  3. Procedures:
    - a. Provide weld procedures for both pre-qualified welds and special welds to be submitted to the Owner's Testing Laboratory and the Architect.
    - b. Provide installation procedure and inspection for direct tension indicator washers detailed in supplemental specifications provided by the manufacturer for approval.
    - c. Procedures shall be submitted for both shop and field welds.
- D. Tests and Inspections:
1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2010 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  2. Testing Laboratory:
    - a. An inspection and testing laboratory will be selected by the Owner for testing and inspection as required by the Contract Documents. The selected laboratory shall conform to the requirements of ASTM E329 (Recommended Practice for Inspection and Testing Agencies used in Construction). Documentary evidence of such conformance shall be submitted to the Owner and the governing agency.
    - b. All materials, work, methods and equipment shall be subject to inspection at the mill, fabricating plant and at the building site. Material or workmanship not complying fully with the Contract Documents will not be accepted. The Contractor shall give the Testing Laboratory reasonable notice when ready for inspection and shall supply samples and test pieces and all facilities for inspection without extra charge. The Owner will assume the expense of making the tests and inspection except as otherwise specified in Division 1.

3. Cost of Testing and Inspection: Costs of testing and inspection of structural steel, except as specified hereunder and in Division 1, will be paid for by the Owner.
  - a. All transportation costs and per diem living costs for inspection at fabricators' plant further than 75 miles from the job site will be back-charged to the Contractor.
  - b. It is assumed that all fabrication will take place in one shop location only. All additional inspection costs will be back-charged to the Contractor.
  - c. All mill tests and costs of re-test of plain materials shall be at the expense of the Contractor.
  - d. Costs of tests required due to Contractor's failure to provide steel identifiable in accordance with the indicated ASTM designation shall be at the expense of the Contractor.
4. Structural Steel Testing and Inspection:
  - a. Structural Steel: If structural steel tests are indicated as required on the structural drawings, one tension and one bend test shall be made for each size of structural shape, plate and for each tube and pipe size. Tests to be made in accordance with requirements of appropriate ASTM designations.
  - b. If structural steel tests are not indicated as required on the structural drawings, then for shapes, plates, bars, pipe and tubing, manufacturer's certified mill test reports and analysis for each heat will be acceptable for steel identifiable in accordance with indicated ASTM designation. Mill test reports shall indicate the physical and chemical properties of all structural steel used. Correlate individual heat numbers with each specified structural section.
  - c. Unidentifiable Steel:
    - 1) For  $F_y$  less than or equal to 36.0 ksi : Provide one tension and elongation test and one bend for each 5 tons or fraction thereof for each size.
    - 2) For  $F_y$  greater than 36.0 ksi : Provide one tension and elongation test and one bend or flattening for each piece.
  - d. Costs of retests and additional testing required by the use of unidentifiable steels shall be the Contractor's responsibility. Additional costs of testing incurred by the Owner shall be deducted from the Contract Final Payment.
5. Expansion Anchors: Load test as indicated on drawings.
6. Welding Inspection:
  - a. If shop or field welding inspection is indicated on the structural drawings, all shop and field welded operations will be inspected by a qualified welding inspector employed by the Testing Laboratory. Such inspector will be a person trained and thoroughly experienced in inspection of welds. The inspector's ability to distinguish between sound and unsound welding will be reliably established
  - b. The welding inspector will make a systematic record of all welds. This record shall include:
    - 1) Identification marks of welders.
    - 2) List of defective welds.
    - 3) Manner of correction of defects.
  - c. The welding inspector will check the material, equipment and procedure, as well as the welds. He will also check the ability of the welder. He will furnish the Architect with a report, duly verified by him that the welding which is required to be inspected is proper, and has been done in conformity with the Contract Documents, and that he has used all means to determine the quality of the welds.
  - d. Column Flanges: An area extending 6 inches above and below point where girder flanges are attached will be inspected. Column flange edges will be inspected visually, and entire area ultrasonically for lamination, plate discontinuities, and non-metallic inclusions.
  - e. When ultrasonic indications arising from the weld root be interpreted as either a weld defect or the backing strip itself, the Engineer will be notified. The Engineer may require the removal of backing strip. The backing strip will be removed at the expense of the Contractor, and if no root defect is visible the weld will be retested. If no defect is indicated on this retest, and no significant amount of base and weld metal have

been removed, no further repair of welding is necessary. If a defect is indicated, it will be repaired and retested at Contractor's expense.

- f. The ultrasonic instrumentation will be calibrated by the technician to evaluate the quality of the welds in accordance with AWS D1.1.
- g. Other methods of inspection, for example, X-Ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if felt necessary by the inspection laboratory, and with the approval of the Engineer.
- h. Base metal thicker than 1-1/2 inches, when subjected to through thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities directly behind such weld before and after joint completion.
- i. End-welded studs shall be sampled, tested, and inspected per the requirements of the Structural Welding Code - Steel D1.1 Chapter 7, published by the American Welding Society.
- j. At the discretion of the owner's testing agency, the ultrasonic testing frequency may be reduced but may not be less than the following:
- k. Initially, all welds requiring ultrasonic testing will be tested at the rate of 100 percent in order to establish the qualifications of each individual welder. If the reject rate is demonstrated to be less than 5 percent of the welds tested for each welder, then the frequency of testing for that welder may be reduced to 25 percent. If the reject rate increases to 5 percent or more, 100 percent testing will be re-established until the rate is reduced to less than 5 percent. The percentage of rejects will be calculated for each welder independently.
- l. A sampling of a least 40 completed welds will be made for such reduction evaluation. Reject rate is defined as the number of welds containing rejectable defects divided by the number of welds completed. For evaluating the reject rate of continuous welds over 3' in length, each 12 linear inch increment of welds, 1 inch or less in thickness, will be considered as one weld. For evaluating the reject rate of continuous welds greater than 1 inch thickness, each 6 linear inches will be considered one weld.

## 1.5 PRODUCT HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
- B. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## 1.6 SEQUENCING/SCHEDULING

- A. Cooperate and coordinate this work with other trades for anchor bolts, and other required inserts, templates, etc. Align this work prior to installation of other materials.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Structural Steel: Except where indicated on drawings.
  - 1. Channels and other rolled shapes: ASTM A36 unless indicated otherwise on drawings.
  - 2. Angles, plates and bars: ASTM A36 unless indicated otherwise on drawings.
  - 3. W shapes: ASTM A992-50 unless indicated otherwise on drawings.
- B. AISC group 4 and 5 shapes and plates greater than 2 inches thick: ASTM A36 and/or ASTM A572 Grade 50 with supplementary requirements S91 Fine Austenitic Grain Size and S5 Charpy V-Notch Impact Test. For location of Charpy V-Notch test, see ASTM A6

Supplementary Requirement S30. Charpy V-Notch test shall be per ASTM A673, frequency P and shall meet a minimum average value of 20 ft-lbs absorbed energy at 70° F.

- C. Cold-Formed Steel Tubing: ASTM A500, Grade B.
- D. Steel Pipe: ASTM A53, Type E or S, Grade B.
- E. Anchor Bolts: All anchor bolts cast in concrete or masonry shall be headed bolts with cut threads conforming to ASTM F1554 grade 36, 55 or 105 as indicated on drawings.
- F. Machine Bolts: ASTM A307.
- G. Headed Stud-Type Shear Connectors: ASTM A108 Grade 1015 or 1020 Cold-finished carbon steel with dimensions complying with AISC Specifications.
  - 1. Tensile strength, 60,000 psi.
  - 2. Elongation in 2 inches, 20 percent
  - 3. Reduction of area, 50 percent.
- H. Provide hexagonal heads and nuts for all connections per ASTM A563, Appendix Table X1.1.
- I. Electrodes for Welding: Comply with AWS Code, E70 Series minimum. Fabricator to select proper electrodes according to weld procedures as submitted.
- J. Shop Primer:
  - 1. Type A Material: Tnemec Company, Inc., 88HS
  - 2. Type B Material: Tnemec Company, Inc., 90-97 Tneme-Zinc.
  - 3. All paints shall meet the California Air Resources Board Standards.
  - 4. Finish paint Material (uno): Tnemec Company, Inc., Series 75- Endura-Shield. Color to be selected by owner.
- K. Expansion Bolts: Hilti Fastening Systems "Kwik-Bolt Concrete Expansion Anchors" to concrete; Ramset "Dynabolt Sleeve Anchors" to masonry or approved equal.

### PART 3 - EXECUTION

#### 3.1 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assembly structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated to provide the flattest floor possible. The contractor shall coordinate member tolerances with finishes.

Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

- B. Connections: Weld or bolt shop connections, as indicted. Bolt field connections, except where welded connections or other connections are indicated.
- C. Unless noted otherwise, make holes 1/16 inches larger than the nominal bolt diameter.

D. Welding, Shop and Field: Weld by shielded arc method, submerged arc method, flux cored arc method, or other method approved by AWS. Perform welding in accordance with AWS Code. All welders, both manual and automatic, shall be certified in accordance with AWS "Standard Qualification Procedure" for the Work to be performed. See paragraph "welding" herein, for detailed requirements. If sizes of fillet welds are not shown on drawings, use AWS minimum weld size but not less than 3/16 inch fillet welds.

E. Bolt Holes for Other Work: Provide holes required for securing other work to structural steel framing.

Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

Cut, drill, or punch holes perpendicular to metal surfaces and remove all burrs. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

F. AISC Group 4 and 5 shapes and built up members shall meet the requirements for joints in AISC Sections J1.7, J1.8, J2.6 and M2.2.

### 3.2 WELDING

A. General: Quality of materials and design and fabrication of all welded connections shall conform to AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Building," "AWS Code for Welding in Building Construction," and requirements of this section.

Location and type of all welds shall be as shown. Make no other welded splices, except those shown on drawings, without prior approval of the architect.

B. Automatic Welding: Use electrode wire and flux for automatic and semi-automatic welding acceptable to Structural Engineer. All methods, sequences, qualification and procedures, including preheating, and post heating if necessary, shall be detailed in writing and submitted to the Structural Engineer for review.

C. Qualification of Welders:

1. Structural steel welding: Manual and automatic welds for structural steel construction shall be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform type of work required.
2. Welders shall be checked by welding inspector. Those not doing satisfactory work may be removed, and may be required to pass qualification tests again. All qualification testing shall be at the Contractor's expense.
3. Only welders whose weld procedures and pre-qualification by testing that have passed shall be considered qualified for such welds.

D. Control cooling process after weld is completed by either step down post heat or thermal blankets as determined by procedures and prequalification.

E. Box columns and built-up members shall have ultrasonic testing before and after welding.

F. Flame cut surfaces shall be ground to remove contaminated steel layer to provide welds proper fusion without impurities.

G. Preparation of surface: Surfaces to be welded shall be free of loose scale, slag, rust, grease, paint, and any other foreign material.

- H. Welding equipment: Welding equipment to be used in each case shall be acceptable to welding inspector. Use equipment with suitable devices to regulate speed, and manually adjust operating amperage and voltage. The amperage capacity shall be sufficient to overcome line drop, and to give adequate welding heat.
- I. Remove runoff tabs and grind surfaces smooth where the tabs would interfere with fireproofing and architectural finishes.
- J. End-welded studs:
  - 1. Automatic end-welded studs: Automatically end-weld in accordance with the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plates. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8 inch for 5/8 inch, and 3/16 inch for 3/4 inch diameter. Stud sizes indicated on drawings represent the finish stud height.
  - 2. Fillet-end welded studs: Studs may be welded using prequalified FCAW, GMAW, or SMAW processes provided the requirements of the AWS D1.1 Chapter 7 Section 7.5.5 are met as well as any other pertinent requirements of D1.1.
- K. Provide mill camber as shown on the construction documents within AISC tolerance. Place mill tolerance upward for all beams specified no camber.

### 3.3 ERECTION

- A. Structural steel erection: Comply with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Building", latest edition.
- B. Erection Sequence: Erect steel in accordance with special erection sequences where special erection sequences are indicated on the contract documents.
- C. Before and during erection, keep all structural steel clean. Ship, handle and store steel in manner to avoid injury to members. Steel members showing evidence to rough handling or injury will be rejected.
- D. Mark each member with erection identification corresponding to mark shown on erection drawings. Carefully plan erection of structural steel so that no cutting and removal of material will be necessary. Do not torch burn in the field, unless specifically permitted by Engineer.
- E. Provide sufficient bracing, shoring and guys to effect safe and satisfactory erection. Provide bracing and shoring capable of holding steel work plumb and properly aligned while field connections are being made, and until lateral force resisting elements are deemed by Architect capable of bracing structure. Temporary bracing shall be adequate to resist lateral forces from wind or seismic prior to the completion of the lateral resisting system.
- F. Set bearing and base plates with extreme care. Bring level, to line and grade with leveling plates or by leveling nuts and bolts. Grout solid under plates with a flowable non-shrink grout per Section 03 30 00 prior to applying vertical load.
- G. Field Assembly: Set structural framing accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces which will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.



Shimming or other adjustments not indicated on drawings shall be approved by the Engineer prior to installation. Level and plumb individual members of the structure within specified AISC tolerances except as noted herein. Column shimming shall be 1/4 inch.

- H. All welds shall be full and clean, and conform to AISC and AWS specifications.
- I. Erection Tolerances: Individual pieces shall be erected so that the deviation from plumb, level and alignment shall not exceed 1 to 500 plus:
  - 1. The maximum displacement of the center line of columns adjacent to elevator shafts, from the established column line, shall not be more than 1 inch at any point.
  - 2. In order to provide a true, flat plane for the exterior elevations, install all steel framing at the exterior walls of the building, so that the center lines of such framing does not vary by more than 1 inch for the length of the building. Also install each vertical member on such grids so that its vertical center line does not vary by more than 1/2 inch from a vertical line for each story and 1 inch for its full height.
  - 3. All columns and beams shall adhere to Section M2.7 of the referenced "Specification for Structural Steel for Buildings" which states that completed members shall be free of twists, bends, and open joints. Take special care that column base plates are parallel and perpendicular to faces of columns and that bolt holes are accurately placed.

### 3.4 PAINTING AND CLEANING

- A. Prior to prime coat application, clean all loose rust, mill scale, oil, dirt, and all other materials from all steel to be left exposed. Use hand tool, power tool, sandblasting, chemical cleaning, and any other method necessary to provide a smooth, sound surface for painting.
- B. Shop prime all steel except the following:
  - 1. Steel encased in concrete.
  - 2. Contact surfaces for slip-critical (sc) high strength bolts.
  - 3. Areas within 4 inches of field welds.
  - 4. Tops of members to receive metal decking.
  - 5. Steel to be fireproofed.
  - 6. Surfaces to be galvanized.
- C. Use the following Type A shop painting systems on all normal environment interior steelwork:
  - 1. Surface Preparation: SSPC-SP2 Hand Tool Cleaning or SSPC-SP3 Power Tool Cleaning. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 Commercial Blast Cleaning is required.
  - 2. Application: Follow coating manufacturer's printed directions.
  - 3. Material: Type A Tnemec Series 88HS Azeron Primer.
  - 4. Number of Coats: One
  - 5. Dry Film Thickness: 2.0 mils minimum.
  - 6. Volume Solids: 60.0 +/- 2.0% minimum
  - 7. Generic Description: Modified Alkyd.
- D. Use the following Type B shop painting systems on all exterior steelwork and interior steelwork subjected to wet conditions or fumes:
  - 1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning
  - 2. Application: Follow coating manufacturer's printed directions.
  - 3. Material: Type B Tnemec 90-97 Tneme-Zinc primer
  - 4. Number of Coats: One
  - 5. Dry Film Thickness: 2.5 mils minimum.
  - 6. Volume Solids: 63% +/- 2%
  - 7. Generic Description: Organic Zinc-Rich Urethane

- E. Use the following finish painting systems on all exterior steelwork and interior steel work subjected to wet conditions or fumes:
  - 1. Application: Follow coating manufacturer's printed directions. Apply over Type B primer system above.
  - 2. Material: Tnemec Series 75 Endura-Shield paint.
  - 3. Number of Coats: One
  - 4. Dry Film Thickness: 3 to 5 mils
  - 5. Volume Solids: 72% +/- 2%
  - 6. Generic Description: Aliphatic Polyurethane
- F. Apply two shop prime coats to areas which will be inaccessible after erection.
- G. Clean contact surfaces of high strength bolts of all burrs and material which might prevent solid seating of the parts. Steel to receive bolts shall be primer painted except beneath the contact area of slip-critical bolts.
- H. After erection, field touch up all welded areas, high strength bolts and damaged areas. For all steel to remain exposed, remove all blemishes, paint drips, and touch up prime coat.

### 3.5 HOISTING AND BRACING

- A. Provide all hoisting and erecting equipment and power.
- B. Provide and maintain any and all safety railings, toe boards, etc., required for the erection of steel framing and metal decking.
- C. Brace the erected frame in a manner which will assure safety and proper alignment to receive the metal decking and until the concrete slabs have been poured and have set.
- D. Erect building frame true and level. Erect columns in a manner to allow for movement due to welding shrinkage and thermal expansion and contraction of framing. Check plumbness after erection of each level. Maintain structural stability of frame during erection. Provide temporary bracing where necessary to maintain frame stability and to support required loads, including equipment and its operation.

END OF SECTION 05 12 00

**PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS**

A. Requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE**

A. Shop fabricated metal items and miscellaneous metal work.

B. Refer to Schedule at end of this Section.

**1.3 RELATED WORK (See also Table of Contents)**

A. Pre-Fabricated Metal Building: Section 13 34 19.

**1.4 QUALITY ASSURANCE**

A. Standards and References: (Latest Edition unless otherwise noted)

1. 2010 California Building Code (CBC), with State of California Amendments
2. American Society for Testing and Materials (ASTM) Specifications as listed in the Section.

B. Submittals: (Submit under provisions of Section 01 33 00)

1. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevation, and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
2. Manufacturer's descriptive data: Submit for manufacturer's items.

**1.5 DELIVERY, STORAGE AND HANDLING**

A. Deliver all parts ready for erection; store in close proximity to final locations.

**PART 2 - PRODUCTS****2.1 MATERIALS**

A. Steel Sections: ASTM A36.

B. Steel Tubing: ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Type E or S, Grade. B.

D. Steel Bolts, Nuts, and Washers: ASTM A307.

E. Welding Materials: AWS D1.1; type required for materials being welded.

F. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Provide G-90 coating for all exposed catwalk framing and fasteners. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", Galvweldalloy", or approved equal.

G. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.

I. Expansion Bolts: Hilti "Kwik Bolt 3" Expansion Anchor Bolts, galvanized unless otherwise indicated.

- J. Non-shrink Grout: Master builders 928 or equal.
- K. Metal Grating:
  - 1. Catwalk Grating: Type B pressure lock. Galvanized G-60.
  - 2. Trench Drain Grating: Provide Galvanized G-60 grating to support H20 vehicle load.

## 2.2 FABRICATION

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate items with joints tightly fitted and secured.
- C. Fit and shop assemble in largest practical sections, for delivery to jobsite.
- D. Grind exposed welds flush and smooth adjacent finished surfaces. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.
- F. Make exposed joints butt tight, flush and hairline.
- G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

## 2.3 FINISH

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.
- C. Prime paint interior items with one coat unless scheduled to be galvanized.
- D. Galvanize exterior items to G-90 coating as noted on plans.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Obtain Architect's approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip primed steel items to bare metal where site welding is scheduled.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Supply items required to be cast into concrete with setting templates, for installation under appropriate Sections.

### 3.2 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Perform field welding in accordance with AWS D1.1.

- C. After installation, touch-up field welds, scratched or damaged surfaces with primer, except repair exposed galvanized work (not to be painted) with hot process field galvanizing, in accord with manufacturer's published directions.

### 3.3 SCHEDULE

- A. Provide and install items listed in Schedule and shown on Drawings with anchorage and attachment necessary for installation. The following Schedule lists principal items only. Refer to drawing details for items not specifically scheduled.
  - 1. Miscellaneous plates or angles not attached to structural steel; complete with anchorage for embedment.
  - 2. Exterior mounted ladders.
  - 3. Handrails and guardrails.
  - 4. Bollards.
  - 5. Stairs
  - 6. Catwalk framing

END OF SECTION 05 50 00

**PART 1 - GENERAL****1.1 GENERAL REQUIREMENTS:**

A. Requirements of Division 1 apply to all Work of this Section.

**1.2 SCOPE:**

A. Furnish and install all metal stairs, handrails and railings, and associated accessories including plates, angles, hangers and struts for securing to structure.

**1.3 RELATED WORK (See also Table of Contents)**

A. Metal Fabrications: Section 05 50 00.

**1.4 QUALITY ASSURANCE****A. General:**

1. Fabricator: Regularly providing work of type required for not less than five years.
2. Installer shall have a minimum of two years experience in the satisfactory installation of metal stairs.
3. All loading conditions resulting in eccentricities or torsion to beams and/or columns shall be resolved by the installation of stiffeners and diagonal struts designed, supplied, and installed by the stair supplier.
4. For conditions where specific details are not shown, detailing shall be identical or similar to corresponding and comparable details. Should there be any questions, contact the Architect prior to proceeding.
5. 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.
6. Comply with code requirements for stair and railing design to provide handicap access.
7. Welders performing welding on stairs shall be qualified in conformance with AWS D1.1
8. Metal stair grating treads to be galvanized G-90 as specified in Section 05 50 00.
9. Field verify dimensions prior to fabrication to insure that materials and/or connections do not interfere with architectural clearances and finishes.

**B. Standards and References: (Latest Edition unless otherwise noted)**

1. American Welding Society (AWS): D1.1, Structural Welding Code.
2. National Association of Architectural Metal Manufacturers (NAAMM):
  - a. Metal Stairs Manual.
  - b. Pipe Rail Manual.
3. 2010 California Building Code (CBC),
4. California Building Code requirements for the physically handicapped.
5. AISC: American Institute of Steel Construction (Steel Manual)

**C. Design Criteria:**

1. Stairs and landings shall support a minimum uniform live load of 100-psf with a safety factor as required by code and individual stair treads shall support a 300-pound concentrated load placed in a position which would cause maximum stress.
2. Railings shall be designed to resist a load of at least 200-pounds applied in any direction at any point to the top rail and also a vertical and horizontal thrust of 50-pounds per lineal foot applied to the top rail.
3. All loading conditions resulting in eccentricities or torsion to beams and/or columns shall be resolved by the installation of stiffeners and diagonal struts designed, supplied, and installed by the stair supplier.

4. Stair assemblies shall be designed for seismic loads per the latest International Building Code.  $R_p = 2.5$ . Seismic forces and interstory drift shall be accounted for in the design and detailing. Resolve forces and brace to main structure.
  5. Maximum allowable Live Load deflection =  $L/360$ .
- D. Submittals: (Submit under provisions of Section 01 33 00)
1. Submit shop drawings and calculations signed by a Civil Engineer, registered in the state of California, for review by the Architect/Engineer and approval by the enforcement agency prior to fabrication.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: For surfaces exposed to view, use materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Metal Stairs.
1. Stair treads and risers shall be minimum as specified on drawings.
  2. Stringer and member sizes indicated on drawings shall be the minimum sizes allowed.
- C. Steel Sections, Plates, Shapes and Bars: ASTM A36.
- D. Structural Steel Sheet: Hot rolled, ASTM A570; or cold rolled, ASTM A611, Class 1; or grade required for design loading.
- E. 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.
- F. Steel Tubing: Cold formed ASTM A500; or hot rolled, ASTM A501; minimum Grade B; seamless where exposed.
- 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-dip galvanized, ASTM A153.
- H. Grout: Non-shrink meeting ASTM E827, non-metallic, pre-mixed, factory-packaged, non-staining, non-corrosive; type specifically recommended by manufacturer as applicable to job condition.
1. Master Builders/Masterflow 713 or 928.
  2. Euclid N-S Grout.
- I. Welding Materials: AWS D1.1, type required for materials being welded.

### 2.2 FABRICATION

- A. General:
1. Construct stairs to conform to sizes and arrangements indicated; join pieces together by welding unless otherwise indicated.
  2. Provide complete stair assemblies including metal framing, hangers, columns, struts, clips, brackets, bearing plates and other components necessary for support of stairs and platforms and to anchor the stairs on the supporting structure.
  3. Exact dimensions and conditions shall be detailed based on the conditions and details provided. Do not substitute details without separate written approval.
- B. Stair Framing:
1. Fabricate stringers of structural steel channels or tube steel as indicated. Flat plate stringers will not be permitted.

2. Provide closures for exposed ends of stringers.
  3. Construct platforms of structural steel channel or tube steel headers and miscellaneous framing members.
  4. Bolt or weld headers to stringers, and framing members to stringers and headers; fabricate and join with concealed bolts.
- C. Stair Type: See drawings for locations.
1. Closed riser grating treads.
    - a. Form using fabricator's standard Type B grating at thickness required to meet design loadings.
    - b. Shop weld treads between stair stringers to create a single flight unit.
- D. Railings and Handrails:
1. Railings and handrails shall be smooth with welded connections. Welds shall be ground smooth with no visible grind marks.
  2. Railings and handrails shall be constructed of steel members of sizes standard with fabricator or as indicated on drawings.
  3. Railings shall run continuously to each landing post.
  4. Handrails shall be secured to walls with brackets.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
1. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated.
  2. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Weld corners and seams continuously, complying with AWS recommendations. Grind exposed welds smooth, flush and imperceptible to match and blend with adjoining surfaces.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Obtain Architect's review prior to site cutting or making adjustments which are not part of scheduled work.
1. Perform necessary cutting and altering for installation of work of other sections.
  2. Beginning of the installation means acceptance of existing conditions.
- B. Install steel stairs and railings square and level, plumb and free from distortion or defects detrimental to appearance and performance.
- C. Make provision for erection stresses by temporary bracing; keep work in alignment.
- D. Ensure alignment with adjacent construction; coordinate with related work to ensure no interruption in installation.
- E. 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.
- F. After installation, touch-up field welds and scratched and damaged surfaces; use coating consistent with that recommended for galvanized surfaces, as applicable.
- G. Replace items damaged in course of installation and construction.
- H. Stair treads shall be uniformly spaced throughout each flight.



**3.2 TOUCH-UP**

- A. Field Touch-Up: Shop coats abraded or burned out by welding shall be touched up before field painting. Field touch-up shall be same paint used for shop coat.

**3.3 TOLERANCES**

- A. Conform to NAAMM - Metal Stair Manual.

**3.4 CLEANUP**

- A. Upon completion of the Project, all debris must be removed and all components to receive final field painting to be properly prepared.
- B. All existing work such as shaft walls, door frames, etc., that are damaged under this work must be prepared to original condition with no additional cost or time to the Project.
- C. Following installation, clean metal stairs and leave in a condition suitable for the installation of concrete fill in treads.

END OF SECTION 05 51 00

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section specifies joint sealing complete for the following applications:
  - 1. Sealant where indicated and where required to make building systems watertight.
- B. Related requirements specified elsewhere:
  - 1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.

## 1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Conform to recommendations of ASTM C 1193
  - 1. Sealing building systems
    - a. Seal typical building joints with non-sag type sealant.
    - b. Seal floor joints with self-leveling type sealant.

## 1.03 SUBMITTALS

- A. Manufacturer's product literature and installation instructions for type and grade of product. Indicate sealant chemical characteristics, substrate preparation, limitations and color availability.
- B. Sample beads for color selection by Architect.
- C. Certification of compatibility by sealant manufacturer of accessory components.
- D. Schedule of proposed sealant for each and every type of joint to be filled.
- E. Submit SWRI certificate of validation verifying Manufacturer's published specification data.

## 1.04 QUALITY ASSURANCE

- A. Manufacturer of sealant and caulking material to certify that cleaners, joint filler or bond breakers, and primers, for a particular application, are compatible with sealant.
- B. Manufacturer certifications: Certify that sealant has been tested for co-hesion and adhesion to surfaces onto which the sealant is placed.

## 1.05 PROJECT CONDITIONS

- A. Environmental Requirements
  - 1. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
  - 2. Do not apply materials when temperature is below 40 degrees Fahrenheit, or under extreme temperature conditions when joint openings are at maximum or minimum width.

## 1.06 WARRANTY

- A. Provide five year warranty. Include coverage for installed sealants and accessories which fail to achieve watertight seal exhibit loss of adhesion or cohesion, or do not cure.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. Acceptable manufacturer's for specified products include manufactures listed including those specified and equivalent products as manufactured by ChemRex Corporation.

## 2.02 MATERIALS

- A. Products of, or certified as compatible by, the approved manufacturer of the sealant or caulking material.
- B. Sealants and caulking compounds
  1. Exterior wall sealant - general purpose: Non-priming, non-sag, one-part polyurethane. Conform to ASTM C 920, Type S, Class 25, Grade NS, Use NT, M, T, A, I, O and Federal Specification TT-S-00230C, Type II, Class A. Colors as selected from manufacturer's standard colors.
  2. Floor and pavement sealant: Pourable, self-leveling, two-part polyurethane; ASTM C 920, Type M, Grade P, Class 25, Use T, colors as selected from manufacturer's standard colors. Minimum Shore hardness of 35. **(NOT IN CONTRACT)**
  3. Sealer Tape for concealed joints between two assembled rigid surfaces in compression: Presstite No. 579.6 as manufactured by Inmont Corporation, Presstite Products Division or "Tacky Tape - SM 5227" as manufactured by Schnee-Moorehead, Inc.; medium density as manufactured by Norton Performance Plastics Corporation, Granville, NY.

## 2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this

section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.

- B. Ensure that newly placed surfaces that are to be sealed have fully cured.

**3.02 PREPARATION**

- A. In accordance with manufacturers' instructions
  1. Mask adjacent surfaces where necessary to maintain neat edge.
  2. Joints and spaces to be sealed: Make clean, dry and free of dust, loose mortar and other foreign materials.
  3. Verify that environmental requirements are within tolerance range as recommended by the manufacturer of the sealant.

**3.03 APPLICATION**

- A. In accordance with manufacturers' instructions and ASTM C 1193.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.
- C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Fill joint space completely from back to top, without voids, and tool slightly concave; finish uniformly smooth without laps, sags, or depressions.

**3.04 ADJUSTING**

- A. Finishing: For work that is exposed to view, tool to a uniform surface with neat, straight edges and no excess material on adjacent surface.

END OF SECTION 07 90 10

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section specifies both interior and exterior field painting for all exposed and semi-exposed surfaces.
- B. Related requirements specified elsewhere
  - 1. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.
  - 2. Caulking - Section 07 90 10, Joint Sealing.
  - 3. Factory finishes or prime coats are specified in various sections.

## 1.02 DEFINITIONS

- A. In accordance with ASTM D16, except that the term "Paint" shall be defined as opaque, transparent, or semi-transparent coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

## 1.03 DESIGN REQUIREMENTS

- A. Design Intent
  - 1. General
    - a. Paint all Work that is normally painted in a building of this type and quality, whether or not the item or surface is specifically identified within the Contract Documents.
    - b. Where painting is required, paint all exposed and semi-exposed surfaces.
    - c. Non-scheduled items: Provide manufacturer's approved and recommended system as set forth in Manufacturer's "Specifications Architectural Finishes".
    - d. The number of coats specified is the minimum to be applied. The Design Intent is that paint finishes be of even, uniform color, free from cloudy or mottled surfaces. Provide one additional coat required where "deep colors" are required.
    - e. Touch-up factory paint finishes where damaged.
  - 2. Specific surfaces to be painted: The listing which follows is intended to provide additional guidance to the Design Intent but it is not intended to be definitive to each and every portion of the Work to be painted.
    - a. Paint behind moveable equipment and furniture.
    - b. Paint panelboards, exposed conduits and plumbing piping, unless otherwise specified not to be painted.
    - c. Paint all exposed and semi-exposed galvanized metal, including projections through and on roofs.
    - d. Paint miscellaneous connections, unless otherwise specified not to be painted.
    - e. Paint exterior equipment and galvanized metal flashings.
    - f. Paint exterior ferrous metal.
  - 3. The following items are specifically excluded from painting.
    - a. Do not paint bright metal, including but not limited to chromium, copper, nickel, brass, bronze or stainless steel
    - b. Do not paint glass.
    - c. Do not paint surfaces indicated on the Drawings as not to be painted.

- d. Do not paint over code-required labels, or any equipment identification, performance rating, name, or nomenclature plates.
- e. Do not paint pre-finished wall and roof assemblies.
- f. Do not paint galvanized gratings, recessed foot grilles; and metal thresholds.
- g. Do not paint stair safety nosings
- h. Exterior concrete flatwork and concrete slab surfaces.
- i. Galvanized catwall framing and metal stairs.

#### 1.04 SUBMITTALS

- A. Product Data
  1. Listing of all materials proposed for use. Identify manufacturer, catalog number and proposed locations and surfaces on which it is to be used.
  2. Manufacturer's color wheel identifying of the manufacture's standard and custom colors.
  3. Color chip samples from manufacture for each color selected from the Manufacture's color wheel.
  4. Manufacturers' technical information and application instructions for each material proposed for use.
  5. For non-specified but acceptable manufacturers submit side by side comparison showing specified product number and the equivalent manufacturer's product number.
- B. Submit 6 samples of each color, sheen, and texture on 8-1/2 by 10-inch hardboard. Label and identify each as to location and application.

#### 1.05 QUALITY ASSURANCE

- A. Regulatory Requirements
  1. Environmental
    - a. Verify that formulation of product conforms with local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application.
    - b. Conform to Air Pollution Control Rules in the District in which they are applied.

#### 1.06 DELIVERY AND STORAGE

- A. Store in accordance with manufacturer's printed instructions. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
- B. Take all precautions and ensure that workmen and work areas are protected from fire hazards and health hazards resulting from handling, mixing and application of Paint materials.

#### 1.07 PROJECT CONDITIONS

- A. Do not apply exterior materials during fog, rain or mist. Do not paint exterior materials when inclement weather is expected within the full drying time specified by the manufacturer.
- B. Environmental Requirements

1. Do not apply paint in rain, fog or mist, or when relative humidity exceeds 85 percent or to damp surfaces, or when temperature is below 55 degrees F. or above 90 degrees F. unless otherwise expressly approved in writing by paint manufacturer.

#### 1.08 SCHEDULING

- A. Schedule work to avoid painting surfaces, when surfaces are exposed to direct sunlight.

#### 1.09 WARRANTY

- A. Warrant for 1 year that the painted surface colors will be substantially unchanged and finishes will maintain their specified appearance without blisters, flaking, peeling, scaling, staining or evidence of other forms of defects as defined by the Master Painters Institute, "Maintenance Repainting Catalog of Defects and Failures".

#### 1.10 EXTRA MATERIALS

- A. Furnish the greater of, 1 percent or 1 gallon, for each type of finish coat of paint in each color used on the project.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Prime Manufacture:
  1. Products scheduled are those manufactured or distributed by the Dunn-Edwards Corporation, Los Angeles, CA.
  2. Other acceptable manufacturers of primary products include Sherwin-Williams Company, ICI Paints, Frazee Paint Company, and Kelly-Moore, or accepted equal.

#### 2.02 MATERIALS

- A. General
  1. Furnish paints ready-mixed, except for field catalyzed coatings.
    - a. Pigments to be fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixture.
    - b. Paints to have good flowing and brushing properties and be capable of drying or curing free of streaks and sags.
  2. Furnish and use thinners and additives approved by paint manufacturer.
  3. Systems: Furnish primers and other undercoat paint produced by same manufacturer as finished coats.
  4. Cleaners, as recommended by the paint manufacturer.
    - a. Dirt: Tri-sodium phosphate
    - b. Stains on cementitious surfaces: Sodium metasilicate
- B. Products specified other than by reference to Master Painters Institute product number.
  1. Asphaltic Based Coating: ASTM D1187.
  2. Zinc Paint: Minimum 65 percent zinc, and conforming to ASTM A 780.

3. Acrylic/epoxy masonry primer/sealer: Dunn-Edwards, "EFF-STOP" W 709; Sherwin-Williams, Loxon Acrylic Primer A24W300; Amorseal; ICI Dulux Devoe Truglaze, or accepted equal; maximum VOC 350 g/l.5.

C. Paint types: Where product is listed by Master Painters Institute product categories provide listed VOC compliant product. Where no VOC compliant product is listed under the MPI product number, propose and submit product that is equal to those listed and which is VOC compliant.

1. Exterior Paints
  - a. Primers/Undercoaters
    - 1) Surface Tolerant Metal Primer: 43-5 Corrobar or W8 Syn-Lustro
    - 2) Etching Cleaner: Consult Paint Manufacturer for Recommendation
    - 3) Interior/Exterior Latex Block Filler: W305 BlocFil (Smooth)
  - b. Secondary and finish opaque coats
    - 1) Quick Drying Alkyd Enamel, Gloss: MPI 96; maximum VOC 250 g/l
    - 6) Exterior Latex Flat: W704V Acri-Flat

## 2.03 FINISHES

- A. Fabricate paints and stains in accordance with the Color Schedule which will include both standard colors and special, non-standard colors.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.
- B. Inspect and test to ensure that no painting occurs over surfaces where moisture content or alkalinity exceeds that permitted in manufacturer's printed directions.
- C. Identify dirt, rust, scale, grease, moisture, scuffed surfaces, and other conditions detrimental to formation of a durable paint film.

### 3.02 PREPARATION

- A. General: In accordance with Referenced Standards for each particular substrate condition.
  1. Protect work and surrounding areas from damage.
    - a. Mask hardware, accessories, fixtures, before surface preparation or painting.
    - b. Remove hardware, accessories and fixtures, if necessary, to complete painting of these items and adjacent surfaces.
    - c. Reinstall removed items immediately following completion of painting of each space or area.
  2. Make surfaces to be painted clean and dry. Remove bond breakers and curing agents.
  3. Provide barrier coats over incompatible primers, or remove and re-prime.
  4. Spot prime shop primed materials in field as required and ensure that all surfaces are primed before finished coats are applied.



- B. Cementitious Surfaces
  - 1. Remove dirt, loose mortar, scale, salt and alkali powder, and other foreign matter.
  - 2. Solution wash and remove oil and grease; rinse and allow to dry.
- C. Metal
  - 1. Un-coated and primed ferrous
    - a. Scrape and sand as required to remove loose primer, rust, and mill scale. Sand out scratches.
    - b. Clean with solvent.
    - c. Prime within 3 hours after preparation.
  - 2. Coated ferrous and zinc
    - a. Solvent clean with lacquer thinner.
    - b. Etch with solution which is approved by the paint manufacture and which will not damage coating or zinc.
    - c. Perform cleaning, etching and priming of each segment of galvanized and cadmium coated metal on same day.
    - d. Prepare hot-dipped galvanized surfaces for repair in accordance with ASTM A 780.

### 3.03 APPLICATION

- A. In accordance with the coating manufacturer's; and in accordance with Master Painters Institute recommendations where MPI recommendations do not conflict with recommendations of the coating manufacturer.
- B. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until:
  - 1. Paint has dried to where it feels firm.
  - 2. Paint does not deform or feel sticky under moderate thumb pressure.
  - 3. Application of another coat of paint will not cause lifting or loss of adhesion of the undercoat.
- 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. Lightly sand and dust first and intermediate coats before succeeding coats are applied. Tint each coat different from preceding coat to approved finish color.
- E. Make work uniform without sags, runs, skips or brush marks. Make all edges sharp including interior intersections and transitions between split finishes.
- F. Paint primed hinges to match the door frame to which they are attached.
- G. Exterior and interior metal primers to be re-coated within the time limits as recommended by the paint manufacturer..

### 3.04 CLEANING

- A. Clean-up
  - 1. During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

2. Upon completion of work, clean paint-spattered surfaces.
  3. Remove oily rags and waste daily.
- B. Touch-up
1. Remove spatters, spots, runs, sags, blemishes and other defects without marring adjacent unpainted surfaces.
  2. Repaint defective surfaces.
- 3.05 PROTECTION
- A. Provide "Wet Paint" signs as required to protect newly-painted finishes.
- B. Do not allow material to enter the storm drain system, sewer system, or the soil.
- 3.06 PAINT SCHEDULE
- A. Exterior systems
1. Metal doors and frames - ferrous
    - a. 1 Coat 43-5 Corrobar
    - b. 2 Coats 10 Syn-Lustro
  2. Mechanical and electrical equipment, panels, conduits and piping
    - a. 1 Coat 43-7 Galv-Alum
    - b. 2 Coats 10 Syn-Lustro
  3. Steel
    - a. 1 Coat 43-5 Corrobar W8 Syn-Lustro Primer (Water Based Option)
    - b. 2 Coats 10 Syn-Lustro W9 Syn-Lustro (Water Based Option)
  4. Galvanized steel
    - a. 1 Coat Etching Cleaner
    - b. 1 Coat 43-7 Galv-Alum
    - c. 2 Coats 10 Syn-Lustro
  5. Concrete block
    - a. 1 Coat W305 BlocFil
    - b. 2 Coats W704 Acri-Flat
  6. Repair of hot dipped galvanized surfaces: Zinc paint. Number of coats as required to equal dry mil thickness of the hot dipped coating.

END OF SECTION

**PART 1 - GENERAL****1.01 SUMMARY**

- A. Section specifies building and site signage.
- B. Documents affecting work of this Section include, but are not limited to, Conditions of the Contract and Sections in Division 01 of these Specifications.

**1.02 SUBMITTALS**

- A. Schedule of identifying devices showing locations, type and copy.
- B. Drawings for shop fabricated items with attachment details and instructions.
- C. Samples of each type of building mounted sign with mounting accessories for each type of sign.
- D. Listing of completed project. Photographic and physical samples as required by the Architect to demonstrate fabricator's qualifications.
- E. Submit manufacturer or fabricator certification that exterior grade photopolymer signs will not swell.

**1.03 QUALITY ASSURANCE**

- A. Regulatory Requirements for accessibility signage: California Code of Regulations, California Building Code, Title 24, Part 2, Chapter 11.
  - 1. Braille symbols: Below text.
    - a. Contracted Grade 2.
    - b. Dots: 0.10-inch on centers within each cell, with 0.20-inch space between cells.
    - c. Raise dots a minimum of .025-inch, above background, as approved by Architect.
  - 3. Proportions: As indicated on the Drawings or otherwise approved by the Architect.
    - a. Width-to-height ratio of between 3:5 and 1:1.
    - b. Stroke width to height ratio between 1:5 and 1:10.
  - 4. Raised letters and numbers:
    - a. Raised 1/32-inch; San-serif or simple serif uppercase characters.
    - b. Height: As indicated on the Drawings or specified elsewhere; minimum 5/8-inch high.

**1.04 WARRANTY**

- A. Guaranty in full, that exterior grade photopolymer sign will not swell, delaminate and keep all specified properties of gloss and color for a period of 3 years.

**PART 2 – PRODUCTS****2.01 SIGNAGE TYPES**

- A. Fabricated the following signs by the specified tactile fabrication process, with eased edges, rounded corners, 1/32 inch raised copy, Braille where indicated. Plate: 1/8 inch thick, unless otherwise indicated.
  - 1. Room Identification signs: Text as indicated on the Drawings.
- B. Metal Parking Signs:
  - 1. Parking lot entrance signs: 17-inches high by 22-inches wide, 1-inch high letters, to read: "Unauthorized vehicles parked in designated accessible spaces not displaying distinguishing placards or license plates issued for persons with disabilities may be towed away at owner's expense. Towed vehicles may be reclaimed at [insert supplied text] or by telephoning [insert supplied text]"

**2.02 FABRICATION**

- A. Tactile signs
  - 1. Tactile inscription: 1/32-inch raised inscription, either PVA acrylic or nylon photopolymer resin.
  - 2. Exterior grade signage: Minimum durometer hardness rating of 90 Shore D, with a manufacturer or fabricator certified 0 percent swell rate in moisture-saturated environments.
    - a. Manufactured signs scheduled for mounting at exterior locations:
      - 1) Been permanently laminated with a clear exterior grade adhesive to a .017-inch aluminum alloy. Furnish unframed, color as selected by Architect from manufacturer's standards.
    - b. Tested in accordance with ASTM G154, after 300 hours, shall show not peel, fade, or crack.
    - c. Provide a positive angle of 25-30 degrees, for the shoulder of inscription to backing.
  - 3. After inscribing, coat plaque with baked-on acrylic polyurethane paint. Clear coat over adhered printed film.
  - 4. Inscription symbols, text and size: As noted on the Drawings.

**PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Before beginning the work specified in this section, carefully inspect the substrate to which the work specified in this section will be applied. Execution of the work specified in this section shall constitute a certification by the Contractor that the substrate is in proper condition to receive subsequent work.

**3.02 INSTALLATION**

- A. Install sign units level, plumb and free from distortion or other defects in appearance.

- B. Install signage in accordance with manufacturers' recommended installation instructions and approved methods as noted on the shop drawings, unless otherwise indicated in the Drawings or Specifications.
  - 1. General: Non-tamper ¼-inch screw fasteners. Provide fasteners at sign corners and elsewhere along edges at 8-inches on centers.
    - a. Metal parking signs: Attach to post with galvanized steel carriage bolt with hex nut and washer; touch up bolt head with paint to match sign background color.
  
- C. Mounting locations
  - 1. Room identifications signs:
    - a. On wall adjacent to strike side of doors at height of 60 inches above finish floor to centerline of sign.
    - b. Performance criteria: Mount so that a person may approach within 3-inches of the signage without encountering protruding objects or the swing of the door.
  - 2. High mounting in accordance with code requirements and as indicated and detailed on the Drawings.

END OF SECTION 10 14 00

**PART 1 - GENERAL****1.01 SUMMARY**

- A. Provide emergency lock box meet the local Fire Department criteria.
  - 1. Coordinate ordering and locating with the Fire Department having jurisdiction.

**1.02 QUALITY ASSURANCE**

- A. Contractor Qualifications: Employ only experienced Contractors (Installers) skilled in the successful installation of the specified or similar products for a minimum of five years. Installers shall be state-certified or licensed Sub-Contractors, or locally registered Sub-Contractors in Northern California.
- B. Manufacturer(s) Qualifications: Employ only manufacturers making the specified materials as a current catalog and regular production item.
- C. Verify that product submittals have been successfully submitted, reviewed and returned.
- D. Source Limitations: Unless specifically noted otherwise, provide products of the same manufacturer for each type of unit.

**1.03 WARRANTY**

- A. Manufacturer's Warranty shall be as stated in Division 1 of the Project Manual.
- B. Unless otherwise stated, duration of all warranties shall start from the date of acceptance by Owner.

**PART 2 - PRODUCTS****2.01 MANUFACTURERS**

- A. KNOX RAPID ENTRY SYSTEM, 17672 Armstrong Avenue, Irvine, California 92614-5728, Phone 949-252-8181 / 888-342-3530 Local Representative.
- B. FAIL-SAFE, Rapid Access System, PO Box 940250, Maitland, FL 32794-0250, Phone: 407-628-1600 / 1-800-946-8832
- C. SUPRA, 4001 Fairview Industrial Dr. SE; Salem, Oregon 97302, Phone: 800-547-0252, ext. 8532.

**2.02 COMPONENT PERFORMANCE CHARACTERISTICS**

- A. System Description:
  - 1. Dimensions: Approximately 4 inches wide x 5 inches high x 4 inches deep and is six-sided. Model to be approved by Local Fire Department.
  - 2. Wall Thickness: 1/4 inch.

3. Construction: Cold-Formed Hollow Structural Steel sections conforming to ASTM A 500 Grade A.
  4. Finish: Manufacturers standard powder coat finish for exterior applications.
  5. Color: Gloss Black.
  6. Rating: UL listed as a Fire Control Accessory.
  7. Keying: The emergency key cabinet shall be equipped with a removable cover that has two (2) different cylinders (the Owner's and the Fire Department's) to open the removable cover.
    - a. Fire Department Key: Master Keying to be provided by the Manufacturer for the Fire Department's access key.
  8. Facility Key: Opening the emergency key cabinet will allow access to a Facility Master Key or Keys. The Master Key shall be on a chain or a hook.
  9. Hardware: Each emergency key cabinet shall be supplied with four (4) tamper proof (security) bolts, nuts and washers that allow installation of the cabinet into the wall. Provide a bolt pattern template with the cabinet.
- B. System Mounting
1. Emergency Key Cabinet (Lock Box) shall be installed by the Contractor.
  2. Cabinet shall be recessed, mounted 6'-8" above finish floor (AFF) to top of cabinet, mounted adjacent to the right of the main entrance door(s).

**PART 3 - EXECUTION****3.01 INSTALLATION**

- A. Installation of the emergency key cabinet (lock box) shall include the recess mounting into the wall including escutcheon plate.
  1. Installation involves drilling four (4) holes through the wall that allows four (4) security bolts to secure the emergency key cabinet (lock box) to the wall. A fifth hole will be drilled that allows the security wiring to be connected in the future.

\* End Section 10 41 16 \*

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section specifies vehicle service equipment, including washing equipment:
  - 1. Cold Water Pressure Washer System.
  - 2. Hot Water Pressure Washer System.
  - 3. Tank Storage.
  - 4. Hose and Spray Gun Assembly.
- B. Roughing-in installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.
- C. Related Requirements Specified Elsewhere:
  - 1. Documents affecting work of this Section include, but are not limited to, conditions of the contract and sections in Division 0 and 1.
  - 2. Division 3 – Concrete.
  - 3. Division 22 – Plumbing.
  - 4. Division 26 – Electrical.

## 1.02 REFERENCE STANDARDS

- A. California Building Code, 2010.
- B. Title 24 California Code of Regulations.
- C. CBC Energy Code.
- D. ASME Code for Unfired Pressure Vessels.

## 1.03 QUALITY ASSURANCE

- A. Manufacturer's Representative:
  - 1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and start up.
  - 2. Training: Provide a qualified manufacturer's representative to provide training to Owner's maintenance personnel in operation and maintenance of specified equipment.

## 1.04 SUBMITTALS

- A. Product Data:
  - 1. Submit Product Data in accordance with Division 1 – General Requirements of these specifications.
  - 2. Restrict submitted material pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.
- B. Operation and Maintenance Manual:
  - 1. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
  - 2. Description of system and components.
  - 3. Schematic diagrams of electrical, plumbing and compressed air systems.
  - 4. Manufacturer's printed operating instructions.



5. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventative maintenance is not a condition for validation of warranties.
  6. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.
  7. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Fold out diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 – General Requirements.
- C. Shop Drawings: Submit Shop Drawings in accordance with Division 1 – General Requirements of these specifications.
- D. Include certified data for each unit and accessory system indicating the following.
1. Indicate components, assembly, dimensions, weights and loadings, required clearances, location and size of field connections, control panel, and electrical pneumatic schematics.

#### 1.05 PRODUCT SUBSTITUTIONS

- A. Follow requirements specified in Division 1 – General Requirements.
- B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.
- C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item shall be provided in accordance with Division 1 – General Requirements. Acceptance will be based on the technical requirements herein as determined by **Owner**.

#### 1.06 WARRANTY

- A. Refer to Division 1 – General Requirements.
- B. Warrant work specified herein for one year from substantial completion against defects in materials, functions and workmanship.
- C. Warranty shall include materials and labor necessary to correct defects.
- D. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer's recommended preventive maintenance schedule.

#### 1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver equipment in manufacturer's containers, approximately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.
- B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title.
- C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

#### 1.08 LABELING

- A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

- B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.
- C. Provide air receivers meeting requirements of ASME Code for Unfired Pressure Vessels and carry ASME approval stamp.

## PART 2 - PRODUCTS

## 2.01 COLD WATER PRESSURE WASHER SYSTEM

- A. Manufacturer's Reference:
  - 1. Prime Manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
    - a. Water Maze; Water Treatments Systems.
    - b. Model: "Water Blaster", Model 30-765.
  - 2. Alternate Manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.
- B. Capacities
  - 1. Motor: 10 HP
  - 2. Pump: Diaphragm pump.
  - 3. Discharge Volume: 26 gpm.
  - 4. Operating Pressure: 500 psi.
  - 5. Voltage and Amperage: 120/240 V; 3 phase; 60A.
  - 6. Weight: 600 lbs, net.
  - 7. Seismic Securement: Provide connection points for seismic bracing to concrete housekeeping slab.
    - a. Provide seismic calculations.
- C. Finish: Durable enamel in manufacturer's standard color.

## 2.02 HOT WATER PRESSURE WASHER SYSTEM

- A. Manufacturer's Reference:
  - 1. Prime Manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
    - a. Landa Cleaning Systems.
    - b. Model: VHG5-30024 B.
  - 2. Alternate Manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.
- B. Capacities
  - 1. Discharge Volume: 4.8 gpm.
  - 2. Operating Pressure: 3000 psi.
  - 3. Motor: 10 HP.
  - 4. Voltage and Amperage: 120/240 V; 3 phase, 60A.
  - 5. Weight: 780 lbs.
  - 6. Approx. BTU's: 480,000.
  - 7. Seismic Securement: Provide connection points for seismic bracing to concrete housekeeping slab.
    - a. Provide seismic calculations.

C. Finish: Durable enamel in manufacturer's standard color.

2.03 TANK, STORAGE, 750 GALLONS

A. Manufacturer's Reference:

1. Prime Manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.
  - a. Norwesco, Inc.
  - b. Model: Vertical "Whtie" Poly Tank; No. 40606.
2. Alternate Manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.

B. Capacities

1. Capacity: 750 gallons.
2. Diameter: 48 inches.
3. Overall Height: 103 inches.
4. Provide as "no hole" design. Manufacturer shall fabricate all openings per Owner requirements and equipment room floor plan.
5. Tank Adaptors: Stainless Steel.
6. Seismic Securement: Provide connection points for seismic bracing to concrete housekeeping slab.
  - a. Provide seismic calculations.

C. Finish: Durable enamel in manufacturer's standard color.

2.04 HOSE AND SPRAY GUN ASSEMBLIES:

- A. Provide two (2) each hose and spray gun assemblies for cold water pressure wash and hot water pressure wash systems.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
- B. Inspect equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.02 INSTALLATION

- A. Perform work to coordinate installation of schedule equipment with **Owner**.
- B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:
1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
  2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

- 3. Anchorage: Attach equipment as recommended by equipment manufacturer. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
- 4. Cold and Hot Water Pressure Washing Systems:
  - a. Install on concrete housekeeping foundation. Level, grout, and bolt in place.
- 5. Fluid Storage Tanks:
  - a. Tank shall be seismically braced and anchored to meet all local, state, and federal codes and provisions.
- C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

- A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the **Owner** using acceptance procedures by the manufacturer.

3.04 CLEANUP

- A. Touch-up damage to painted finishes.
- B. Wipe and clean equipment of any oil, grease and solvents, and make ready for use.
- C. Clean area around equipment installation and remove packing and installation debris from job site.
- D. Notify **Owner** or designated representative for acceptance inspection.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Requirements of Division 1 apply to all Work of this Section

1.2 SCOPE

- A. All labor, materials, tools, equipment, scaffolding or other structures or hoisting, and supervision required for the manufacture, cartage, unloading, storage, installation, cleanup and protection of the pre-engineered metal buildings as specified herein and shown on the plans, details and addenda.
- B. The scope of work in the metal building system includes the following:
  - 1. Designed, pre-engineered, and shop fabricated structural steel framing for roofs, walls, metal stud wall and ceiling framing, and anchor bolt connections, including secondary framing for all equipment.
  - 2. Metal siding and roofing.
  - 3. Metal roofing for Metal Awning Systems, as specified in Section 05 50 00.
  - 4. Gutters and downspouts.
  - 5. Hollow metal doors, frames, and hardware as specified in Sections 08 10 00 and 08 71 00 and as indicated on the Drawings.
  - 6. Overhead coiling door, frame and hardware, as indicated on the drawings.
  - 7. Plastic skylights as indicated on the drawings.
  - 8. Thermal insulation at walls and roof to create a complete thermal enclosure around the metal building perimeter.
  - 9. Prime painting of structural framing, and finish painting of roof and siding panels, canopies and doors.

1.3 RELATED WORK (See also Table of Contents)

- A. Furnish anchor bolts, embeds and layout templates to Section 03 30 00 - Concrete for placement in slab as necessary.
- B. Section 01 23 00: Alternates.
- C. Section 03 10 00: Concrete formwork.
- D. Section 03 21 00: Reinforcing Steel.
- E. Section 03 30 00: Cast-in-place Concrete.
- F. Section 05 40 00: Cold-Formed Metal Framing.
- G. Section 05 50 00: Metal Fabrications.

- H. Section 08 11 00: Metal Doors and Frames.
- I. Section 08 33 00: Overhead Coiling Doors.
- J. Section 11 11 00: Vehicle Maintenance Equipment
- K. Division 15: Mechanical requirements.
- L. Division 15: Fire Protection requirements.
- M. Division 16: Electrical requirements.

#### 1.4 QUALITY ASSURANCE

##### A. Referenced Standards:

1. AISC: "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
2. AISC: "Code of Standard Practice for Steel Buildings and Bridges".
3. CBC: "California Building Code", 2010 edition.
4. AISC: "Specification for the Design of Cold Formed Steel Structural Members", latest edition.
5. AWS: "Structural Welding Code D.1.1".
6. ASTM A36 - Structural Steel.
7. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
8. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
9. ASTM A325 - High Strength Bolts for Structural Steel Joints.
10. ASTM A386 - Zinc-coating (Hot-Dip) on Assembled Steel Products.
11. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
12. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process. (Formerly known as ASTM A446).
13. ASTM A490 - Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
14. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
15. ASTM A501 - Hot Formed Welded and Seamless Carbon Steel Structural Tubing/
16. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hop-Dip Process, General Requirements.
17. ASTM A529 - Structural Steel with 42,000 psi (290 MPa) Minimum Yield Point.

- 18. ASTM A572 - High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.
- 19. AWS A2.0 - Standard Welding Symbols..
- 20. SSPC - Steel Structures Painting Council.

**B. SUBMITTALS**

- 1. Product data: Submit manufacturer's specifications and installation instructions for manufactured products.
- 2. Shop drawings: Submit showing details of construction, layout, anchoring, jointing, and dimensions of fabricated items for review before fabrication and installation. Structural Drawings, calculations and details shall be certified by a Civil Engineer licensed in the State of California.
- 3. Structural calculations: Submit 3 copies of complete structural design calculations prepared and certified by a Civil Engineer licensed in the State of California. Include vertical loads, lateral seismic loads, and lateral wind load calculations. Calculations shall be complete and shall include roof decks, wall panels, structural members, equipment supports, framing around openings, braces and connections.
  - a. Note: Structural calculations shall be submitted with completed Shop Drawings.
  - b. Where structural calculations are electronically prepared submit diagrammatic models of each element clearly cross-referenced to calculations.
- 4. Foundation Loads: Submit complete Building Reactions for all CBC required load combinations for use in designing the foundation system. The Building Reactions shall be certified by a Civil Engineer licensed in the State of California.
- 5. ICBO evaluation report for roof panels used as structural diaphragms to resist Wind or Seismic loads.
- 6. Samples: Submit color samples of siding, roofing and interior panels. Samples shall be actual paint system and selected colors applied on metal.
- 7. Contractor shall provide all submittals, calculations, and certifications required to obtain and pay for permits for the building from the building official.

**C. INSPECTION**

- 1. Verify that conditions are satisfactory for installation or metal building systems and verify that conditions are satisfactory for installation of components. If unsatisfactory conditions exist, do not commence installation of components until such conditions have been corrected.

**1.5 SYSTEM DESCRIPTION**

- A. Clear span rigid frame.
- B. Bay spacing as shown on drawings. Columns and vertical supports shall occur only in locations shown.
- C. Primary framing: Rigid frame of rafter beams and columns, canopy beams, intermediate columns, wall columns and wind bracing.

- D. Secondary framing: Purlins, girts, eave struts, flange bracing, sill supports, clips, and other items detailed. Provide sag rods to girts at 10'-0" cc maximum.
- E. Wall and roof system: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, insulation and accessory components.
- F. Roof slope: As shown on Drawings.
- G. Insulation: R-13 walls, R-19 roof. Provide vinyl-faced lining; maximum Flame Spread Index 25 and maximum Smoke Density 450, where exposed to the building interior or enclosed attic spaces.

**1.6 STRUCTURAL DESIGN REQUIREMENTS**

**A. General Requirements:**

- 1. The building structure shall be designed to conform with the CBC and with all additional requirements as set forth in this specification:
- 2. Loads for stress, drift and deflection calculations shall be as specified below.
- 3. Field measurement: Make field measurement as required prior to fabrication and installation.
- 4. Coordination: Coordinate with other Work to ensure proper sequencing and fitting of construction.
- 5. Shop assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordination installation.

**B. Loads:**

**1. Dead Loads:**

**a. Building Dead Loads**

- 1) Dead Loads shall include the weight of the building system. Including, but not limited to, columns, frames, purlins, roofing and covering members.

**b. Collateral Dead Loads**

- 1) Dead Loads shall include the weight of all permanent elements shown on the drawings other than the building system. Including, but not limited to, mechanical equipment and ducting, plumbing, electrical, sprinklers, suspended ceilings, tilt-up walls, overhead cranes, overhead reels, operable walls, fixed equipment, etc., supported on or suspended from the roof, floor or walls.
- 2) 7 pounds per square foot minimum unless actual loads result in more critical stress or deflection.
- 3) 150 pound concentrated load applied anywhere on the roof or canopy framing. This load need not be applied to the metal deck.



2. Live Loads:
  - a. Roof Live Loads shall not be less than any of the following:
    - 1) Uniform Live Load of 20 pounds per square foot on roofs and canopies. This live load may NOT be reduced on the basis of tributary area.
    - 2) 250 pound concentrated load applied anywhere on the roof or canopy framing. This live load is non-concurrent with the live load listed above. This load need not be applied to the metal deck.
3. Snow Loads:
  - a. Snow loads for roofs and canopies shall not be less than the following snow load:
    - 1) Uniform snow load,  $P_f$ , on roofs and canopies
$$P_f = \text{Importance Factor} \times 30 \text{ pounds per square foot}$$
where the Importance Factor is 1.0.
  - b. Snow Loads shall include effects of unbalanced snow loads, special eave requirements, drift loads, impact loads and vertical obstructions per the Appendix to Chapter 16 of the CBC.
4. Wind Loads:
  - a. Wind forces shall be computed ASCE 7-05 Chapter 6 Method 1 or 2.
  - b. Basic Wind Speed
    - 1) The Basic Wind Speed is defined as the three-second gust speed at 33 ft above the ground in Exposure C as determined in accordance with Section 6.5.4 of ASCE 7-05.
    - 2) The Basic Wind Speed shall be 85 MPH. Use of lower wind speeds is not acceptable.
  - c. Exposure Category:
    - 1) The Exposure Category shall be C.
  - d. Wind Importance Factor:
    - 1) The Wind Importance Factor,  $I_w$ , shall be 1.00.
5. Seismic Loads:
  - a. Seismic forces shall be computed according to the CBC with additional criteria as listed below.
    - 1)  $S_s = 0.431$
    - 2)  $S_1 = 0.191$
    - 3)  $S_{DS} = 0.418$

- 4)  $S_{D1} = 0.259$
  - 5)  $I = 1.0$
  - 6)  $R = 3.5$
  - 7)  $C_d = 3$
  - 8)  $\Omega_0 = 3$
  - 9) Period, T, shall be per ASCE 7-05 section 12.8.2.
- b. The building structure shall be designed to provide lateral resistance to seismic forces generated from, but not limited to the sum of the following:
- 1) Dead Loads, including Collateral Loads, as specified above.
  - 2) Seismic mass due to interior partitions shall not be taken as less 5 pounds per square foot.
  - 3) Full snow load as specified above if the snow load specified above is 30 pounds per square foot or greater.
6. Auxiliary Loads:
- a. Loads from overhead building supported cranes shall be included.
    - 1) Weight of the hoist, trolley, bridge and railways shall be included in the Collateral Dead Load.
    - 2) The Rated Capacity of the crane plus Impact shall be included in the Live Loads.
- C. Deflections and Drift:
1. Deflections and Drifts shall be calculated using the forces specified above.
  2. Deflections of roof and canopy decks shall not exceed:
    - a.  $L/240$  of the center-to-center span subject to Dead (including Collateral) plus Live Loads.
    - b.  $L/240$  of the center-to-center span subject to Dead (including Collateral) plus Snow Loads.
    - c.  $L/240$  of the center-to-center span subject to Dead (including Collateral) plus Wind Loads.
  3. Deflections of structural members shall not exceed:
    - a.  $L/240$  of the clear span subject to Dead (including Collateral) plus Live Loads.
    - b.  $L/240$  of the clear span subject to Dead (including Collateral) plus Snow Loads.
    - c.  $L/240$  of the clear span subject to Dead (including Collateral) plus Wind Loads.
  4. Seismic Drift:

- a. Drift analysis shall be based upon strength level forces as set forth in this specification.
  - b. Drift analysis shall be an elastic static analysis neglecting stiffness contributed by elements not part of the lateral force resisting system.
  - c. Lateral drift due to seismic forces computed at the eave shall be limited to 0.007 times the eave height.
5. Wind Drift:
- a. Lateral drift due to wind forces computed at the eave shall be limited to 0.005 times the eave height.
- D. Lateral Bracing System Requirements:
1. The use of Cables shall not be allowed for Roof Diaphragm Bracing and Transverse Vertical Bracing.
  2. Longitudinal vertical (wall) bracing shall meet the following requirements:
    - a. Lateral force resisting system shall consist of moment resisting frames.
    - b. Slenderness ratio (Length/Radius of Gyration) shall be not greater than 150.
    - c. Frame locations shall be coordinated with the Architectural Drawings.
  3. Roof diaphragm bracing shall meet the following requirements: If rod bracing or other tension only braces are used and where the slenderness ratio exceeds 180, the braces shall be designed for 2 times the code specified forces, including the Importance Factor.
  4. General Requirements:
    - a. Bracing and connections shall be capable of transferring loads from structure to foundations in a direct manner. Eccentricities shall be avoided, and shall be accounted for where they occur. Stiffeners shall be added where required so that bending of column and/or beam webs perpendicular to the plane of the webs is avoided.
    - b. There shall be a complete and continuous "collector" and "chord" system capable of delivering the code specified lateral forces to the bracing systems. Collector and chord members shall be designed to resist axial tension and compression forces in combination with any other loads delivered simultaneously to these members.
    - c. Adequate tie-downs for overturning forces to the foundations shall be provided.
    - d. Columns shall be hinged at the base in both directions.
- E. Expansion and sliding joints: Where applicable to building length, separation may be provided to allow seismic and thermal movements of framing members in the longitudinal axis of the building. "Double columns" are allowed at the separation. Coordinate locations with Architectural Drawings.
- G. Where integral items of work are not included as part of this section, Contractor shall make special effort in coordinating and in detailing the Work. The metal building system is design/build; therefore, not all design details are indicated, or can be indicated, in the Contract Documents for relationship among the various types of Work.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Provide factory wrapping, packaging, and other means necessary to prevent damage or deterioration during shipment, handling and storage.
- B. Maintain protective coverings in place and in good repair until removal is necessary for the Work.
- C. Store products inside enclosed storage facilities or closed building, supported above grade and slabs-on-grade.
- D. Maintain storage spaces and products in dry condition at all times and within temperature extremes recommended by manufacturer. Follow any special instructions by manufacturer.

1.8 PROTECTION

- A. Protect products against damage during field handling and installation.
- B. Protect adjacent existing and newly placed construction and finishes as necessary to prevent damage during installation of this Work.

1.9 WARRANTY

- A. Guarantee for a period of one year from the date of completion that all Work specified in this Section shall be free from defects in materials and workmanship.
- B. Guarantee for a period of 20 years from the date of completion that the paint finish shall not fade or discolor, and will perform as specified, and that the roof, siding, and other exterior building components shall not leak water, deteriorate, or otherwise fail to perform as required.
- C. In accordance with the terms of the guarantee, locate and repair the defective workmanship, replace the defective material, and remove and replace other Work which has been connected to or superimposed on the Work to be repaired or replaced. Also repair or replace any portion of the Work damaged by the defect or repair of it.

PART 2 - PRODUCTS

2.1 ACCEPTED MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. ARMCO Building Systems
  - 2. Butler Manufacturing Company
  - 3. Varco-Pruden Company
  - 4. Metallic Building Systems
  - 5. Star
  - 6. Approved equivalent
- B. Each manufacturer to modify its standard metal building systems as necessary to comply with the requirements indicated in the Contract Documents.

2.2 MATERIALS

- A. Roof Panels:
  - 1. The exposed metal roof construction shall be of such configuration to provide the load carrying capabilities and deflection requirements of this Specification.

2. Metal roof panels shall be a minimum 36 inches wide (net coverage) by 1-1/2 inches deep minimum 24 gauge panels of the exterior type to which the thermal insulation and various interior finishes may be field applied. The metal faces shall be of zinc coated steel, and shall be supplied with a factory applied painted finish. Panel shall be sculptured for rigidity, and secured to the purlins with self-drilling structural screws with painted head assembled with a separate EPDM washer.
3. Integrate translucent plastic roof panels into manufacture's roof panel system. Translucent plastic panels shall be glass fiber reinforced resin or thermoformed ABS 1/8 inch minimum thickness, manufacturer's standard color.
4. Where roof panels are to be used as structural diaphragms to resist wind or seismic forces, roof decks must have and ICC-ES approval and be installed in conformance with all ICC-ES requirements. Shear values shall not exceed ICC-ES approved values.

B. Purlins (Roof Support Members):

1. The configuration, thickness, and spacing of the purlins shall be the building manufacturer's standard; the depth shall be 8 inches. The allowable design capacity of cold formed purlin members shall be calculated in accordance with the provisions of the AISI "Specification for the Design of Cold Formed Steel Structural Members". The manufacturer shall certify that the purlin bracing system provided conforms to Metal Buildings Manufacturers Association requirements.
2. Any intermediate supports between purlins necessary to support mechanical units above or below the roof shall be provided as part of the work of this section.

C. Wall Panels:

1. Metal curtain wall panels shall be a minimum 36 inches wide (net coverage) by 1-1/2 inches deep minimum 24 gauge panels of the exterior type to which the thermal insulation and various interior finishes may be field applied. The metal faces shall be of zinc coated steel, and shall be supplied with a factory applied painted finish. Panel shall be sculptured for rigidity.
2. The covering width and configuration of the panel shall be the building manufacturer's standard design provided all design criteria, including deflection, are met or exceeded. Side seams shall be overlapping and concealed.
3. The wall panels shall be fastened to supports with screws or bolts. Fasteners within 8 feet of grade shall be tamperproof rivets or security fasteners.
4. The top, bottom and intermediate panel closures, flashings and trim shall be the building manufacturer's standard, matching the material furnished as wall panels.
5. Gutters shall be manufacturers standard or wide profile, sized per SMACNA rainfall and drainage criteria for roof area of each building. Fascias will be chosen by Contracting Officer from manufacturer's standard lines.
6. Downspouts shall be manufacturer's standard large rectangular profile sized per SMACNA rainfall criteria.

D. Liner Panels:

1. Metal liner panels shall be a minimum of 36 inches wide (net coverage) by 1-1/2 inches deep minimum 24 gauge.

## E. Girts:

1. The girt's configuration and thickness shall be the building manufacturer's standard, provided all design criteria, including deflection and girt spacing, are met. Provide sag rods and indicate rod locations on Shop Drawings.
2. Based on a simple span, the deflection of the girts supporting the wall coverings shall be limited by the effect of deflection in the particular type of interior wall finish specified herein. In no case shall deflections exceed limits specified in this Specification. Forces producing deflections shall be based on the previously prescribed design wind and seismic loads.
3. In addition to or in lieu of manufacturer's standard spacing, girts shall be located at the following elevations: 3'-6" from top of girt to finished floor.

## F. Hollow Metal Doors and Frames:

1. Provide manufacturer's standard flush, hollow metal doors and frames, complete with finish hardware, keyed to match the Owner's master key system.
2. Provide storeroom lock (cylinder type) function, US26D Finish and jamb, head and sill weather stripping.
3. Hollow metal doors and frames shall be factory primed for field paint finish.

## G. Overhead Coiling Doors:

1. Design and provide Overhead Coiling Door framing and mounting requirements to resist Wind Loads as specified in this specification.
2. Provide metal siding or flashing as required to close off framed openings.

## H. Paint:

1. All exterior wall and roof panels to be factory coated with a thermosetting type finish of a formulation designed to provide 20 years of film and color life.
2. Structural Steel to be prepared per SSPC-SP 3-63 and primed with a lead-free rust inhibitive alkyd metal primer, color to be selected by Contracting Officer. Exposed Exterior Structural Steel shall receive a Finish Paint, as previously noted.

## 2.3 FABRICATION

## A. General:

1. Coordinate metalwork with adjoining work for details of attachment, fittings, etc. Be responsible for fabrication, detailing and correct fitting of steel members to each other and to their supports.
2. Use materials of size and thickness indicated, or if not indicated, of required size and thickness to produce strength and durability in finished product. Work to dimensions indicated or as required, using proven details of fabrication and support. Use type of materials indicated or specified for various components of Work.
3. Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges. Ease exposed edges, unless otherwise indicated. Form bent metal corners

to smallest radius possible without causing grain separation or otherwise impairing work. Form joints exposed to weather to exclude water.

- 4. Make permanent connections in ferrous metal surfaces using welds wherever possible; do not use bolts or screws where they can be avoided. Conceal fastenings where practical.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install components and systems to comply with the requirements of the Contract Documents, applicable standards, and governing codes.
- B. Install work sloped where indicated; otherwise plumb, level, and true to line with tolerances not exceeding 1/4 inch in runs of 20 feet.
- C. Anchor components securely in place; provide for necessary thermal and structural movements.
- D. The exterior envelope of the building shall be watertight to the interior; no uncontrolled water shall infiltrate into the building.
- E. Do not install any prefinished component which has defects, including damaged finish, dents, warps or bends.
- F. In order to minimize the potential of damaging the finish coating, do not remove the protective coating or wrapping until the component is ready for installation.
- G. Provide bitumastic paint, 15 mils minimum DFT, between dissimilar materials to prevent galvanic corrosion.

**3.2 CLEANING AND PROTECTION**

- A. Clean exposed surfaces of pre-finished work promptly after completion of installation. Comply with recommendations of the coating manufacturer.
- B. Remove shavings from the face of siding and finished surfaces of building to prevent them from rusting and discoloring paint surfaces.
- C. Protect the pre-finished work as needed to ensure that the work will be without damage or deterioration at the time of final acceptance.

**3.3 REPAIR AND TOUCH UP**

- A. Remove and replace panels and component parts of the work which have been damaged (including finish) beyond successful repair, as determined by the Contracting Officer. Repair minor damage as acceptable to the Contracting Officer.
- B. Repair minor damage on the painted finish with touch-up paint. Touch-up paint shall be field-applied type, siliconized acrylic or urethane, with exact color, gloss, and appearance match. Touch-up paint only the actual damaged area with very little overlap to undamaged area.

END OF SECTION 13 34 19

## PART 1 - GENERAL

## 1.1 APPLICABLE REQUIREMENTS

- A. All work under this Section shall comply with the requirements of General Conditions, Supplemental Conditions, Special Conditions and Division 01 - General Requirements, and shall include all Mechanical Sections specified herein.

## 1.2 SCOPE OF THIS SECTION

- A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
1. Compliance with all codes and standards applicable to this jurisdiction.
  2. Shop Drawings for Equipment
  3. Coordination Documents
  4. Record Drawings
  5. Start-up Service and Building Commissioning
  6. Instruction, Maintenance, and O & M Manuals
  7. Work associated with Delivery, Storage, and Handling of products
  8. Work associated with provision of Temporary Facilities
  9. Preparation of Posted Operating Instructions
  10. Meeting Project Safety and Indemnity requirements
  11. Proper Cleaning and Closing
  12. Supplying proper Warranty information
  13. Supply specified Guarantee documentation
  14. Design and provision of Supports and Anchors
  15. Design and provision of Seismic Restraints and Vibration Isolation
  16. Identification Markers
  17. Coordination of Electrical requirements for equipment provided

## 1.3 DESCRIPTION OF WORK

- A. The Contract Documents, including Specifications and Construction Drawings, are intended to provide all material and labor to install complete plumbing systems for the building and shall interface with all existing building systems affected by new construction.
- B. The Contractor shall refer to the architectural interior details, floor plans, elevations, and the structural and other Contract Drawings and he shall coordinate his work with that of the other trades to avoid interference. The plans are diagrammatic and show generally the locations of the fixtures, equipment, and pipe lines and are not to be scaled; all dimensions and existing conditions shall be checked at the building.
- C. The Contractor shall comply with the project closeout requirements as detailed in General Requirements of Division 01.
- D. Where project involves interface with existing building and site systems, every effort has been made to note existing utilities and services. However, the Contractor should thoroughly familiarize themselves with existing conditions and be aware that in some cases information is not available as to concealed conditions, which exist in portions of the existing building affected by this work.



## 1.4 DESCRIPTION OF BID DOCUMENTS

- A. Specifications:
  - 1. Specifications, in general, describe quality and character of materials and equipment.
  - 2. Specifications are of simplified form and include incomplete sentences.
  
- B. Drawings:
  - 1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and methods of installation.
  - 2. Before proceeding with work check and verify all dimensions.
  - 3. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
  - 4. Make adjustments that may be necessary or requested, in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
  - 5. Where existing pipes, conduits, etc. prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits, etc. Verify exact location and elevation of existing piping prior to any construction.
  - 6. If any part of Specifications or Drawings appears unclear or contradictory, apply to Architect or Engineer for his interpretation and decision as early as possible, including during bidding period.

## 1.5 DEFINITIONS

- A. "Above Grade": Not buried in the ground and not embedded in concrete slab on ground.
- B. "Actuating" or "Control" Devices: Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.
- C. "Below Grade": Buried in the ground or embedded in concrete slab on ground.
- D. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures. In general, any item not visible or directly accessible.
- E. "Connect": Complete hook-up of item with required service.
- F. "Exposed": Not installed underground or "concealed."
- G. "Furnish": To supply equipment and products as specified.
- H. "Indicated," "Shown" or "Noted": As indicated, shown or noted on Drawings or Specifications.
- I. "Install": To erect, mount and connect complete with related accessories.
- J. "Motor Controllers": Manual or magnetic starters (with or without switches), individual push buttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- K. "Piping": Pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.
- L. "Provide": To supply, install and connect as specified for a complete, safe and operationally ready system.

- M. "Reviewed," "Satisfactory" or "Directed": As reviewed, satisfactory, or directed by or to Architect/Engineer/Owner.
- N. "Rough-In": Provide all indicated services in the necessary arrangement suitable for making final connections to fixture or equipment.
- O. "Shall": An exhortation or command to complete the specified task.
- P. "Similar" or "Equal": Of base bid manufacture, equal in materials, weight, size, design, and efficiency of specified products.
- Q. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
- R. "Typical" or "Typ": Exhibiting the qualities, traits, or characteristics that identify a kind, class, number, group or category. Of or relating to a representative specimen. Application shall apply to all other similarly identified on plan or detail.
- S. "Will": A desire to complete the specified task. Allows some flexibility in application as opposed to "Shall."
- T. "Wiring": Raceway, fittings, wire, boxes and related items.
- U. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

**1.6 RELATED WORK SPECIFIED ELSEWHERE**

- A. All Division 22 Plumbing sections included herein.
- B. Division 02: Existing Conditions.
  - 1. Coordination of excavation of trenches and the installation of mechanical systems and piping on site.
- C. Division 03: Concrete.
  - 1. All concrete work for Plumbing Division shall be included in Division 22 under the appropriate Sections and shall include:
    - a. Concrete curbs and housekeeping pads for the mechanical equipment.
    - b. Coordination of floor drain and floor sink installations in sloped floors.
- D. Division 05
- E. Division 07: Thermal and Moisture Protection.
  - 1. Flashing and sheet metal.
  - 2. Sealants and caulking.
  - 3. Firestopping.
- F. Division 09: Finishes:
  - 1. Division 22 installers shall perform all painting, except where specifically stated otherwise in Division 09.
  - 2. Painting of all exposed steel, piping, equipment, and materials.
  - 3. Paint all exposed gas piping, exterior to the building, yellow.
- G. Division 26: Electrical is related to work of:
  - 1. Power connections to all plumbing equipment.

2. Life safety provisions.

### 1.7 CODES AND STANDARDS

- A. The Contractor is cautioned that code requirements not explicitly detailed in these specifications or drawings, but which may be reasonably inferred or implied from the nature of the project, must be provided as part of the contract.
- B. Perform all tests required by governing authorities and required under all Division 22 Sections. Provide written reports on all tests.
- C. Electrical devices and wiring shall conform to the latest standards of NEC; all devices shall be UL listed and labeled.
- D. All plumbing work shall comply with the Americans with Disabilities Act (ADA).
- E. All excavation work must comply with all provisions of state laws including notification to all owners of underground utilities at least 48 business day hours, but not more than 10 business days, before commencing an excavation.
- F. Provide in accordance with rules and regulations of the following:
  1. Building Codes enforced by the Authority Having Jurisdiction in California:
    - a. 2010 California Building Code (CBC) based 2009 International Building Code (IBC) with State Amendments.
    - b. 2010 California Plumbing Code (CPC) based on 2009 Uniform Plumbing Code (UPC) with State Amendments.
    - c. 2010 California Electric Code (CEC) based 2008 National Electric Code with State Amendments.
    - d. 2008 Title 24, Part 6 California Energy Efficiency Standards for Residential and Nonresidential Buildings
  2. Local, city, county and state codes and ordinances.
  3. Local Health Department.
  4. Local and State Fire Prevention Districts.
  5. State Administrative Codes.
- G. Provide in accordance with appropriate referenced standards of the following:
  1. NFPA - National Fire Protection Association.
  2. CSA - Canadian Standards Association.
  3. ADC - Air Diffuser Council.
  4. ANSI - American National Standards Institute.
  5. ASHRAE - American Society of Heating, Refrigerating & Air Conditioning Engineers.
  6. ASME - American Society of Mechanical Engineers.
  7. ASTM - American Society for Testing Materials.
  8. AWS - American Welding Society.
  9. AWWA - American Water Works Association.
  10. FM - Factory Mutual.
  11. MSS - Manufacturer's Standardization Society.
  12. NEMA - National Electrical Manufacturer's Association.
  13. SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
  14. UL - Underwriter's Laboratories.
  15. ADA - Americans with Disabilities Act.
  16. ETL - Electrical Testing Laboratories.
  17. ASSE - American Society of Sanitary Engineers.
  18. PDI - Plumbing and Drainage Institute.
  19. IAPMO - International Association of Plumbing and Mechanical Officials.

20. CISPI - Cast Iron Soil Pipe Institute.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer's Nameplates: Nameplates on manufactured items shall be aluminum or Type 304 stainless steel sheet, not less than 20 USG (0.0375"), riveted or bolted to the manufactured item, with nameplate data engraved or punched to form a non-erasable record of equipment data.
- B. Current Models. All work shall be as follows:
  - 1. Manufactured items furnished shall be the current, cataloged product of the manufacturer.
  - 2. Replacement parts shall be readily available and stocked in the USA.
- C. Experience: Unless more stringent requirements are specified in other sections of Division 22, manufactured items shall have been installed and used, without modification, renovation or repair, on other projects for not less than one year prior to the date of bidding for this project.

#### 1.9 GENERAL REQUIREMENTS

- A. Examine all existing conditions at building site.
- B. Review contract documents and technical specifications for extent of new work to be provided.
- C. Provide and pay for all permits, licenses, fees and inspections.
- D. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. This work shall include furnishing and installing all access doors required for mechanical access.
- E. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to Equipment Specifications in Divisions 02 through 48 for rough-in requirements.
- F. Coordinate mechanical equipment and materials installation with other building components.
- G. Verify all dimensions by field measurements.
- H. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- I. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- J. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- K. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials. Contractor to provide for all cutting and patching required for installation of his work unless otherwise noted.

- L. Where mounting heights are not detailed or dimensioned, install plumbing services and overhead equipment to provide the maximum headroom possible.
- M. Install plumbing equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, without interference with other installations.
- N. Coordinate connection of plumbing systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- O. Coordinate with Owner in advance to schedule shutdown of existing systems to make new connections. Provide valves in new piping to allow existing system to be put back in service with minimum down time.
- P. All materials (such as insulation, piping, wiring, controls, etc.) located within occupied spaces shall have a flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA 255) Method. In addition, the products, when tested, shall not drip flame particles, and flame shall not be progressive. Provide Underwriters Laboratories, Inc., label or listing, or satisfactory certified test report from an approved testing laboratory to prove the fire hazard ratings for materials proposed for use do not exceed those specified.
- Q. Coordinate installation of floor drains and floor sinks with work of other trades, such that finished floor slopes to drains and floor sinks are flush with surrounding floor.
- R. Products made of or containing lead, asbestos, mercury or other known toxic or hazardous materials are not acceptable for installation under this Division. Any such products installed as part of the work of the Division shall be removed and replaced and all costs for removal and replacement shall be borne solely by the installing Contractor.

#### 1.10 MINOR DEVIATIONS

- A. The Drawings are diagrammatic and show the general arrangements of all plumbing work and requirements to be performed. It is not intended to show or indicate all offsets, fittings, and accessories which will be required as a part of the work of this Section.
- B. The Contractor shall review the structural and architectural conditions affecting his work. It is the specific intention of this section that the contractor's scope of work shall include
  1. Proper code complying support systems for all equipment whether or not scheduled or detailed on drawings or in these specifications
  2. Minor deviations from the plumbing plans required by architectural and structural coordination.
- C. The Contractor shall study the operational requirements of each system, and shall arrange his work accordingly, and shall furnish such fittings, offsets, supports, accessories, as are required for the proper and efficient installation of all systems from the physical space available for use by this section. This requirement extends to the Contractor's coordination of this section's work with the "Electrical Work." Should conflicts occur due to lack of coordination, the time delay, cost of rectification, demolition, labor and materials, shall be borne by the Contractor and shall not be at a cost to the Owner.
- D. Minor deviations in order to avoid conflict shall be permitted where the design intent is not altered.

- E. Advise the Architect, in writing, in the event a conflict occurs in the location or connection of equipment. Bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Architect of conflict.

#### 1.11 PRODUCT SUBSTITUTIONS

- A. The Contractor shall certify the following items are correct when using substituted products other than those scheduled or shown on the drawings as a basis of design:
  - 1. The proposed substitution does not affect dimensions shown on drawings.
  - 2. The Contractor shall pay for changes to building design, including engineering design, detailing, structural supports, and construction costs caused by proposed substitution.
  - 3. The proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
  - 4. Maintenance and service parts available locally are readily obtainable for the proposed substitute.
- B. The Contractor further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.
- C. The Contractor agrees that the terms and conditions for the substituted product that are found in the contract documents apply to this proposed substitution.

#### 1.12 SHOP DRAWINGS AND EQUIPMENT SUBMITTALS

- A. Prior to construction submit for review all materials and equipment in accordance with Division 01 requirements.
- B. After approval of preliminary list of materials, the Contractor shall submit Shop Drawings and manufacturer's Certified Drawings to the Architect for approval.
- C. The Contractor shall submit approved Shop Drawings and manufacturer's equipment cuts, of all equipment requiring connection by Division 26, to the Electrical Contractor for final coordination of electrical requirements. Contractor shall bear all additional costs for failure to coordinate with Division 26.
- D. Submittals and Shop Drawings shall be submitted as a complete package bound in a 3-ring binder with tabs for each specification section. The approved submittals shall be converted into Operations & Maintenance Manuals at the completion of the project. Submit six (6) typed copies of submittals. Refer to Division 01 for additional requirements.

#### 1.13 RECORD DRAWINGS

- A. Before commencing installation, obtain an extra set of prints from Architect, marked "Record." Keep this set of Drawings at the job site at all times, and use it for no other purpose but to mark on it all the changes and revisions to the Contract Drawings resulting from coordination with other trades. At the completion of the project,
  - 1. Obtain a clean set of reproduces from the Architect or Engineer, at cost plus, and transfer the revisions to these reproduces in a neat and orderly fashion.

OR

2. Edit project AutoCAD files to incorporate all site markups, changes, and revisions to the Contract Drawings. Submit plots of Record Drawings and six copies CD Roms labeled with all record AutoCAD drawing files.
- B. Mark Drawings to indicate revisions to piping size and location both exterior and interior; including locations of control devices, valves, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e. – valves, traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.
- D. Refer also to Special Conditions in Division 01 for full scope of requirements.

#### 1.14 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials in an environmentally controlled area at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage. Piping shall be stored in bundles covered with visqueen. Piping showing signs of rust shall be removed from site and replaced.
- C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

#### 1.15 TEMPORARY FACILITIES

- A. Refer to Division 01 for the requirements of temporary water and sewer for construction and safety. Provide temporary water, and sewer, etc. services as necessary during the construction period and as required to maintain operation of existing systems.

#### 1.16 SAFETY AND INDEMNITY

- A. The Contractor shall be solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal hours of work.
- B. No act, service, Drawing, review, or Construction Review by the Owner, Architect, the Engineers or their consultants, is intended to include the review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify and defend the Owner, the Architect, the Engineers and their consultants, and each of their officers, employees and agents from any and all liability claim, losses or damage arising, 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 the 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 the sole negligence of the Owner, the Architect, the Engineers, and their consultants or their officers, employees and agents.

**1.17 CLEANING AND CLOSING**

- A. All work shall be inspected, tested, and approved before being concealed or placed in operation.
- B. Upon completion of the work, all equipment installed as specified in this section, and all areas where work was performed, shall be cleaned to provide operating conditions satisfactory to the Architect.

**1.18 WARRANTIES**

- A. All equipment shall be provided with a minimum one-year warranty to include parts and labor. Refer to individual Equipment Specifications for extended or longer-term warranty requirements.
- B. Provide complete warranty information for each item, to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.
- C. Service during warranty period: Contractor shall provide maintenance as specified elsewhere during the 12-month warranty period.

**1.19 GUARANTEE**

- A. The Contractor shall guarantee and service all workmanship and materials to be as represented by him and shall repair or replace, at no additional cost to the Owner, any part thereof which may become defective within the period of one (1) year after the Date of Final Acceptance, ordinary wear and tear excepted.
- B. Contractor shall be responsible for and pay for any damages caused by or resulting from defects in his work.

**PART 2 - PRODUCTS****2.1 GENERAL**

- A. Furnish and install all new material, equipment, and apparatus hereinafter specified unless specifically noted otherwise. All material, equipment, and apparatus shall be identified by the manufacturer's name, nameplate, and pertinent data.
- B. All materials, equipment, and apparatus are mentioned as standards unless noted otherwise. The words "or approved equal" shall be considered to be subsequent to all manufacturers' names used herein, unless specifically noted that substitutes are not allowed.



## 2.2 SUPPORTS AND ANCHORS

- A. General: Comply with applicable codes pertaining to product materials and installation of supports and anchors, including, but not limited to, the following:
1. UL: Provide products, which are UL listed.
  2. ASCE 7-05: "American Society of Civil Engineers."
  3. 2006 International Building Code (IBC)
  4. MSS Standard Compliance: Manufacturer's Standardization Society (MSS).
  5. SMACNA: "Seismic Restraint Manual: Guidelines for Mechanical Systems."
  6. NFPA: Pamphlet number 13 and 14 for fire protection systems.
  7. Provide copper plated or plastic coated supports and attachment for copper piping systems. Field applied coatings or tape is unacceptable.
  8. Manufacturer: B-Line, Grinnell, Michigan, Tolco, Kin-Line, Simpson, or Superstrut.
- B. Horizontal Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated hangers and supports of one of the following MSS types listed.
1. Adjustable Steel Clevis Hangers: MSS Type 1.
  2. Adjustable Steel Swivel Band Hangers: MSS Type 10.
  3. U-Bolts: MSS Type 24.
  4. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
    - a. Plate: Unguided type.
    - b. Plate: Guided type.
    - c. Plate: Hold-down clamp type.
  5. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast iron floor flange.
  6. Pipe Saddle Supports with U-Bolt: MSS Type 37, including steel pipe base support and cast iron floor flange.
  7. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast iron floor flange.
  8. Single Pipe Roller with Malleable Sockets: MSS Type 41.
  9. Adjustable Roller Hangers: MSS Type 43.
  10. Pipe Roll Stands: MSS Type 44.
  11. Pipe Guides: Provide factory-fabricated guides of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.
- C. Horizontal Cushioned Pipe Clamp: Where pipe hangers are called out to absorb vibration or shock install a piping clamp with thermoplastic elastomer insert. Cush-A-Clamp or equal.
- D. Vertical Piping Clamps: Provide factory-fabricated two-bolt vertical piping riser clamps, MSS Type 8.
- E. Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments of one of the following MSS types listed.
1. Steel Turnbuckles: MSS Type 13.
  2. Steel Clevises: MSS Type 14.
  3. Swivel Turnbuckles: MSS Type 15.
  4. Malleable Iron Eye Sockets: MSS Type 16.
  5. Steel Weldless Eye Nuts: MSS Type 17.
- F. Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments of one of the following types listed.
1. Concrete Inserts: MSS Type 18 or Blue Banger Hanger by Simpson
  2. Steel Brackets: One of the following for indicated loading:

- a. Light Duty: MSS Type 31.
  - b. Medium Duty: MSS Type 32.
  - c. Heavy Duty: MSS Type 33.
  3. Horizontal Travelers: MSS Type 58.
  4. Internally Threaded Expansion Shell Anchors: By Simpson or approved equal.
  5. Concrete Screw Anchors: Titen HD by Simpson or approved equal.
  6. Anchor Bolts: Heavy duty, drilled-in concrete expansion wedge anchor bolts, Hilti or Red Head.
- G. Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
1. Pipe Covering Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
  2. Insulation Protection Shields: MSS Type 40, 18" minimum, or of the length recommended by manufacturer to prevent crushing of insulation. High-density insulation insert lengths shall match or exceed shield length.
  3. Thermal Hanger Shields: Constructed of 360° insert of waterproofed calcium silicate (60 psi flexural strength minimum) encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation. Shield length shall match or exceed length of calcium silicate insert.
  4. Thermal Hanger Couplings: Constructed of high strength plastic coupling to retain tubing and join insulation at clevis hangers and strut-mounted clamps. Klo-Shure Insulation Coupling or equal.
- H. Miscellaneous Materials:
1. Metal Framing: Provide products complying with NEMA STD ML1.
  2. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.
  3. Cement Grout: Portland Cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand by volume, with minimum amount of water required for placement and hydration.
  4. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required. Weld steel in accordance with AWS standards.
  5. Pipe Brackets: "HoldRite" copper plated brackets. Insulate brackets attached to metal studs with felt.

### 2.3 SEISMIC RESTRAINT/VIBRATION ISOLATION REQUIREMENTS

- A. Piping and all system appurtenances (including weight of normal operating contents) shall be adequately restrained to resist seismic forces. Restraint devices shall be designed and selected to meet seismic requirements as defined in Chapter 16 of the latest edition of the UBC, with State Amendments, and applicable local codes and the applicable Importance Factors and Soil Factors.
- B. All anchorages and/or seismic restraints shall be designed by a registered professional Civil or Structural Engineer licensed in the state of the project. Design shall include:
1. Number, size and location of anchors for floor or roof-mounted equipment. For curb mounted equipment, provide design of attachment of both the unit to the curb and the curb to the structure.
  2. Number, size and location of vibration isolators, seismic restraint devices and their anchorage for vibration-isolated and suspended equipment.
  3. Number, size and location of braces and anchors for suspended piping and ductwork on shop drawings.
    - a. The contractor must select a single seismic restraint system pre-designed to meet

- the requirements of the current version of the IBC <<UBC>>, with State Amendments.
- b. Installations not addressed by the selected system must be designed, detailed and submitted along with the shop drawings.
  - c. Maximum seismic loads shall be indicated on drawings at each brace location.
  - d. Drawings shall bear the stamp and signature of the registered professional engineer licensed in the state of the project who designed the layout of the braces.
4. Manufacturers: Mason, M.W. Sausse, Kinetics or approved equal.
- C. All non-isolated piping shall be protected in accordance with the SMACNA Guidelines. At the Contractor's option, for ease of installation, cable restraint system may be used. Installations not addressed in the SMACNA Guidelines shall be designed by a registered professional engineer who designed the seismic bracing for the suspended piping and ductwork.
- D. Submittals:
1. Confirmation of responsible design party (Shop Drawings received without this information will be rejected without review. Architect will be informed of potential delay of project.)
    - a. The seismic manufacturer's representative or engineer responsible for preparing the specified seismic submittal package shall send the following documentation of qualification:
      - 1) The name and professional engineer's license number of the structural engineer who will be responsible for preparing, designing, and stamping the seismic shop drawing information.
  2. Shop Drawings submittal
    - a. Stamped seismic restraint calculations.
    - b. The type, size and deflection of each isolator proposed.
    - c. Details for all the isolators with snubbers proposed and seismic bracing.
    - d. Details for steel frames to be used in conjunction with the isolation and seismic restraint of the items.
    - e. Clearly outlined procedures for installing and adjusting the isolators, seismic restraints and snubbers.
- 2.4 IDENTIFICATION MARKERS
- A. Mechanical Identification Materials: Provide products of categories and types required for each application as referenced in other Division 22 Sections. Where more than single type is specified for application, selection is installer's option, but provide single selection for each product category. Stencils are not acceptable.
- B. Plastic Pipe Markers:
1. Snap-On Type: Provide pre-printed, semi-rigid snap-on, color coded pipe markers, complying with ANSI A13.1.
  2. Pressure Sensitive Type: Provide pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers, complying with ANSI A13.1. Secure both ends of markers with color coded adhesive vinyl tape.
  3. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125°F (52°C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
  4. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
- C. Underground-Type Plastic Line Markers: Provide 6" wide x 4 mils thick multi-ply tape, consisting of solid metallic foil core between 2 layers of plastic tape. Markers to be permanent, bright colored, continuous printed, intended for direct burial service.

- D. Valve Tags:
1. Brass Valve Tags: Provide 1 1/2" diameter 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener. Fill tag engraving with black enamel.
  2. Plastic Laminate Valve Tags: Provide 3/32" thick engraved plastic laminate valve tags, with piping system abbreviations in 1/4" high letters and sequenced valve number 1/2" high, and with 5/32" hole for fasteners.
  3. Valve Tag Fasteners: Provide solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
  4. Access Panel Markers: Provide 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.
  5. Non-potable Water Tags: 1/16" thick, engraved, plastic tags as indicated on Drawings.
- E. Acceptable Manufacturers: Craftmark, Seton, Brady, Marking Services, Inc., or Brimar.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Workmanship shall be performed by licensed journeymen or master mechanics and shall result in an installation consistent with the best practices of trades.
- B. Install work uniform, level and plumb, in relationship to lines of building. Do not install any diagonal, or otherwise irregular work unless so indicated on Drawings or approved by Architect.

#### 3.2 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturers' directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the Drawings or covered in these Specifications.

#### 3.3 INSTALLATION

- A. Coordinate the work between the various Plumbing Sections and with the work specified under other Divisions. If any cooperative work must be altered due to lack of proper supervision or failure to make proper and timely provisions, the alternations shall be made to the satisfaction of the Engineer and at the Contractor's cost.
- B. Inspect all material, equipment, and apparatus upon delivery and do not install any damaged or defected materials.

#### 3.4 SUPPORTS AND HANGERS

- A. Prior to installation of hangers, supports, anchors, and associated work, installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives, (if any), installers of other work with requirements specified.
- B. Installation of Building Attachments: Install building attachments at required locations within concrete or on structural steel for proper piping support. Install additional building attachments

where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed. Fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through opening at top of inserts.

- C. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including, but not limited to, proper placement of inserts, anchors, and other building structural attachments.
- D. Install hangers, supports, clamps, and attachments to support piping properly from building structure. 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.
- E. Install hangers within 12 inches of every change in piping direction, end of pipe run or concentrated load, and within 36 inches of every major piece of equipment. Hangers shall be installed on both sides of flexible connections. Where flexible connection connects directly to a piece of equipment only one hanger is required.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- G. Support gas independently of other piping.
- H. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- I. Hanger Spacing in accordance with following minimum schedules (other spacings and rod sizes may be used in accordance with the SMACNA Seismic Restraint Manual using a safety factor of five):

1.	Steel Pipe (Water Filled):		
	<u>Pipe Size</u>	<u>Max. Hanger Spacing</u>	<u>Rod Size</u>
	1/2" to 1 1/4"	5 feet	3/8"
	1 1/2" to 2"	7 feet	3/8"
2.	Steel Pipe (Gas):		
	<u>Pipe Size</u>	<u>Max. Hanger Spacing</u>	<u>Rod Size</u>
	1/2" to 1 1/4"	6 feet	3/8"
3.	Copper Pipe:		
	<u>Pipe Size</u>	<u>Max. Hanger Spacing</u>	<u>Rod Size</u>
	1/2" to 2"	6 feet	3/8"

- J. Sloping, Air Venting, and Draining:
  - 1. Slope all piping as specified and as indicated, true to line and grade, and free of traps and air pockets. Unless indicated otherwise, slope piping in the direction of flow as follows:

<u>Service</u>	<u>Inclination</u>	<u>Slope</u>
Domestic Water	Down	1" per 100'
Heating Water	Up	1" per 40'
Soil and Waste	Down	1/4" per foot (1/8" per foot)
Storm Water	Down	1/4" per foot (1/8" per foot)
Sanitary Vent	Up (towards roof terminal)	1/4" per foot (1/8" per foot)

2. Slope all compressed air branch piping down toward main risers at 1" per 10'.
3. Provide eccentric reducers in horizontal piping for all sizing changes
4. Provide drain valves and hose adapters at all low points in piping.
5. Provide vents at all high points in water piping.

**K. Provisions for Movement:**

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connecting equipment.
3. Insulated Piping: Comply with the following installation requirements:
  - a. Clamps: Attach clamps, including spacers, (if any), to piping with clamps projecting through insulation.
  - b. Shields: Where low compressive strength insulation or vapor barriers are indicated on cold or chilled water piping, install shields or inserts.
  - c. Saddles: Where insulation without vapor barrier is indicated install protection saddles.

**L. Installation of Anchors:**

1. Install anchors at proper locations to prevent excessive stresses and to prevent transfer of loading and stresses to connected equipment.
2. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure.
3. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
4. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and bends.

**M. Adjusting:**

1. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
2. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
3. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

**3.5 PAINTING**

- A. All painting shall be provided under this Division work, unless otherwise specified under Division 09: Painting. Painting schemes shall comply with ANSI A13.1. Paint all exposed materials such as piping, equipment, insulation, steel, etc. Exposed gas piping inside and outside the building shall be painted with two coats of "Rust-O-Leum" Yellow.
- B. All exposed work under Division 22 shall receive either a factory finish or a field prime coat finish, except:
  1. Exposed copper piping.
  2. Aluminum jacketed outdoor insulated piping.

**3.6 IDENTIFICATION MARKERS**

- A. General: Where identification is to be applied to surfaces which require insulation, painting, or other covering or finish, including valve tags in finished mechanical spaces, install identification

after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

- B. Piping System Identification:
1. Install pipe markers on each system indicated to receive identification, and include arrows to show normal direction of flow.
  2. Locate pipe markers as follows:
    - a. Near each valve and control device.
    - b. Near each branch, excluding short take-offs for fixtures; mark each pipe at branch, where there could be question of flow pattern.
    - c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
    - d. At access doors, manholes, and similar access points which permit view of concealed piping.
    - e. Near major equipment items and other points of origination and termination.
    - f. Spaced horizontally at maximum spacing of 20' along each piping run, with minimum of one in each room. Vertically spaced at each story transversed.
- C. Underground Piping Identification: During backfilling/topsoiling of each exterior underground piping system, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker.
- D. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations. Equipment signs shall include an identification of the area or other equipment served by the equipment being labeled.

### 3.7 TESTING

- A. Provide all tests specified hereinafter and as otherwise required. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Test all rotational equipment for proper direction of rotation. Upon completion of testing, certify to the Architect, in writing, that the specified tests have been performed and that the installation complies with the specified requirements and provide a report of the test observations signed by qualified inspector.

END OF SECTION 22 05 00

## PART 1 - GENERAL

## 1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, and Section 220500 - Basic Materials and Methods, and other Sections in Division 22 specified herein.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 220500: Basic Materials and Methods
- B. Section 230700: Mechanical Insulation
- C. Section 222113: Plumbing Piping, Valves and Specialties

## 1.3 SCOPE

- A. All work includes <removing and modifying existing and> providing new plumbing. Systems as specified under this section shall include but not necessarily be limited to the following:
  - 1. Connection to utilities at five (5) feet from the building. Coordinate with the Civil Engineering Plans and/or Division 02 work.
  - 2. Connection of all waste, vent, and water piping to all drains and plumbing equipment.
  - 3. Provide for future expansion as indicated.
  - 4. Provide traps on all floor drains with trap primer where specified. Pipe to trap shall be ½" minimum.
  - 5. Provide floor drainage in equipment rooms.

## 1.4 SUBMITTALS

- A. Prior to construction submit for approval all materials and equipment in accordance with Division 01. Submit manufacturer's data, installation instructions, and maintenance and operating instructions for all components of this section including, but not limited to, the following:
  - 1. Trap primers.
  - 2. Cleanouts.
  - 3. Drains

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the site in containers with manufacturer's stamp or label affixed.
- B. Store and protect products against dirt, water, chemical, and mechanical damage. Do not install damaged products - remove from project site.



## 1.6 WARRANTY

- A. Provide one-year (12 months) warranty. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

## PART 2 - PRODUCTS

## 2.1 GENERAL

- A. All materials and equipment under this Division of the Specifications shall be new, of best grade and as listed in printed catalogs of the manufacturer.
- B. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating.
- C. The following products to be included as part of this work but specified under Section 220500 Basic Materials and Methods and Section 222113 Plumbing Piping, Valves and Specialties:
  - 1. Piping.
  - 2. Valves.
  - 3. Hangers and supports.
  - 4. Escutcheon plates, flashings, and sleeves.
  - 5. Identification markers and signs.
  - 6. Anchors, alignment guides and Seismic Zone 3 requirements.
  - 7. Excavation and backfill.
  - 8. Pressure and temperature gauges.
  - 9. Access Panels.
- D. Plumbing Fixtures: Refer to Section 224000.
- E. Products made of, or containing, lead, asbestos, mercury, or other known toxic or hazardous materials are not acceptable for installation under this Section. Any such products installed as part of the work of this Section shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Contractor(s).

## 2.2 VALVES: DOMESTIC WATER AND LP GAS (SEE SECTION 222113)

## 2.3 CLEANOUTS

- A. Cleanout Plugs: Bronze, taper thread countersunk head.
- B. Floor Cleanouts: Service weight cast-iron body and frame, flange with flashing clamp, adjustable cast-iron collar, caulk inside, Ty-seal or No-hub joints, neoprene plug gasket seal.
  - 1. Carpeted Areas: Zurn ZN-1400-KC-VP-BP-CM or J. R. Smith 4028 C - F - C - Y - U
  - 2. Tiled Areas: Zurn ZN-1400-X-KC-VP-BP or J.R. Smith 4148 - F - C - U
  - 3. Unfinished Areas: Zurn ZN-1400-HD-KC-VP-BP or J.R. Smith 4108 C - F - C - U
  - 4. Yard Areas: Zurn Z 1474-IN-VP or J.R. Smith 4258 - C - U
- C. Cleanout Tee: Cast iron cleanout tee with countersunk brass plug, neoprene plug gasket seal and smooth stainless steel cover.

1. Manufacturer: Zurn Z-1446-BP or J. R. Smith 4532 S (Y)

#### 2.4 ROOF FLASHING

- A. Flashing: Unless indicated otherwise on the drawings flashings for pipes through the roof shall be galvanized sheet metal, 24 gauge minimum << or sheet copper, 8 oz. per sq. ft. minimum >> with seams and joints lapped and soldered watertight. Coordinate with Architectural Sections for flashings and roofing.
- B. Vent Pipes: Provide caulk type, vandalproof hood with Allen head vandal proof screws for all vent pipes through roof or preformed vinyl/galvanized steel assembly.

#### 2.5 DRAINS

- A. General: Provide drains of type and size as indicated on drawings.
  1. Acceptable Manufacturers: J.R. Smith, Zurn, Wade, Sioux Chief, Josam and Watts.
- B. Floor Drain, FD-1 - Mechanical Rooms: Enamel coated cast iron body with flange, clamping collar, seepage openings, 8-1/2" diameter adjustable cast iron bar strainer, sediment bucket, bottom outlet, caulk inside or Ty-Seal or no-hub joint. Provide trap primer.
  1. Manufacturer: Zurn Z-520-Y-P or J.R. Smith 2350 C(Y).
- C. Floor Sink, FS-1: Enamel coated cast iron body with seepage flange, acid resistant interior surfaces, aluminum dome strainer, 12" x 12" x 6", half grate, bottom outlet, caulk inside, Ty-Seal or no-hub joint. Provide trap primer.
  1. Manufacturer: Commercial Enameling series 906-1 or Zurn-ZFD-2375-K-H-Y.

#### 2.6 TRAP PRIMER

- A. Cast bronze construction, vacuum breaker, 1/2" sweat solder connection. Install in accessible location or provide access panel.
  1. Manufacturer: PPP #1 or E&S, for use for up to 8 drains using PPP trap primer distribution units.
  2. Option: Sloan F-72-A1 used in conjunction with water closet flush valve.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. This system to be installed by an experienced firm regularly engaged in the installation of plumbing systems as specified by the requirements of the Specifications.
- B. Install all items specified in this section of the Specification under the full purview of local and state governing agencies.
- C. Refer to Section 220500: General Plumbing Requirements for installation of piping, valves and other requirements.

## 3.2 PERFORMANCE OF WORK

- A. Examine areas, physical conditions and phasing requirements under which materials are to be installed. Layout the system to suit the different types of construction and equipment as indicated on the drawings.
- B. Work shall start immediately after authorization has been given to proceed so that the overall progress of the construction is not delayed. No foundry items to be installed until submittals have been approved.
- C. Coordinate with other trades as necessary to properly interface components of the plumbing system.
- D. Follow manufacturer's directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the drawings or covered in these Specifications.
- E. The omission from the drawings or Specifications of any details of construction, installation, materials, or essential specialties shall not relieve the Contractor from furnishing the same in place for a complete system.

## 3.3 PIPING INSTALLATION

- A. The word "piping" shall mean all pipes, fittings, nipples, valves and all accessories connected thereto.
- B. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts flues, conduits and work of other trades and close to ceiling or other construction as practical, free of unnecessary traps or bends.
- C. Run horizontal sanitary drainage at uniform pitch of not less than 1/8" per foot, unless otherwise indicated. Pitch horizontal vent piping downward from stack to fixtures.
- D. Run drainage piping as straight as possible with long radius turns. Offsets shall be made at an angle of 45° or less.
- E. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.
- F. Piping connections to all equipment shall be made up with unions.
- G. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.
- H. Use reducers or increasers. Use no bushings.
- I. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageway.
- J. Vent pipes to terminate at least 6" above the roof. Provide vandal proof hood assembly.

- K. Cover, cap or otherwise protect open ends of all piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect water supply piping as specified.
- L. Exposed connections to equipment shall be installed with special care, showing no tool marks or threads at fittings and piping. No bowed or bend piping to be permitted.
- M. All ferrous to non-ferrous connections shall be made by means of dielectric fittings. Submit shop drawings for approval.
- N. Use extra heavy pipe for nipples, where unthreaded portion is less than 1½". Use no close nipples. Use only shoulder nipples.
- O. All piping shall be inspected for defects and flaws prior to installation. Remove any damaged piping from job site. Piping shall be thoroughly cleaned of dirt, debris or rust.
- P. Cleanouts to be provided at each change in direction greater than 135° or 100' maximum intervals on underground piping.
- Q. Cleanouts to be same size as pipe except cleanout plugs larger than 4" shall not be required.
- R. Cleanouts on concealed piping to be extended through and terminate flush with the finished wall or floor. Cover plates to be provided on all cleanout plugs in finished areas.
- S. The bodies of cleanout ferrules to conform in thickness to that required for pipe and fittings of the same metal.
- T. Route piping on roof on manufactured polyethylene pipe pier supports "Pipe Pier" by Erico.

### 3.4 TESTING AND DISINFECTING - PLUMBING SYSTEMS

- A. General: The Contractor to perform all field tests and provide all labor, equipment, and incidentals required for the tests. Owner to witness all field tests and conduct all field inspections. The Contractor to give the Owner ample notice of the dates and times scheduled for tests. Any deficiencies to be completely retested at no additional cost.
  - 1. Inspection: Inspection to continue during installation and testing. Perform a final inspection of the equipment prior to installation to determine conformity to the type, class, grade, size, capacity, and other characteristics specified herein or indicated. Correct or replace all rejected equipment prior to installation.
  - 2. Water Distribution Piping Test: Before fixtures are set, subject the entire hot and cold piping system to a hydrostatic pressure test of 150 pounds per square inch with water for not less than 8 hours in order to permit inspection of all joints with no evidence of leakage. Where a portion of the water distribution piping is to be concealed before completion, test this portion separately as specified for the entire system.
  - 3. Sanitary Drainage Vent, Storm, Rainwater and Fixture System Final Test: Give sanitary, drainage vent, and fixture systems an in-service test after complete installation. After all fixtures are installed, test the entire vent and sewer system and prove gas and water tight. Final test shall be with air. Before proceeding with test, fill all traps with water. Close all stacks and line openings during test, for a minimum period of 24 hours. If test reveals leakage of air at any point, repair and retest the system.
  - 4. Disinfection of Water Distribution System: After pressure tests have been made thoroughly flush the entire domestic water distribution system with water until all entrained

dirt and mud have been removed, and sterilize by chlorinating material. The chlorinating material shall be liquid chlorine. The chlorinating material shall provide a dosage of not less than 50 parts per million and shall be introduced into the system or part thereof in an approved manner. Retain the treated water in the pipe for 24 hours, or, fill the system or part thereof with a water-chlorine solution containing at least 200 parts per million of chlorine and allow to stand for three hours. Open and close all valves in the system being disinfected three times during the contact period. Then flush the system with clean potable water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period open and close all valves and faucets three times. From at least three divergent points in the system, take samples of water in properly sterilized containers for bacterial examination. Repeat the disinfecting until tests indicate that satisfactory bacteriological results have been obtained.

- a. Taking of samples shall be witnessed by Architect or Owner's representative. Samples are to be taken and tested by an independent analytical testing laboratory. Written reports shall be supplied to Architect for approval.

### 3.5 OPERATING TESTING AND CERTIFICATION - PLUMBING SYSTEMS

- A. Upon completion and disinfection, and prior to acceptance of the installation, the Contractor to subject the plumbing system to operating tests to demonstrate satisfactory, functional, and operating efficiency. Such operating tests to include the following information in a report with conclusions as to the adequacy of the system.
  1. Time, date, and duration of tests.
  2. Water pressures at most remote location.
  3. Operation of all valves and hydrants.
  4. Operation of all floor drains by flooding with water.
  5. Quality of domestic water.
  6. Read all indicating instruments at half-hour intervals unless otherwise directed. Supply four copies of the test report to the Owner.

### 3.6 CLEANING EQUIPMENT AND MATERIALS

- A. In addition to the requirements of Section 220500, provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care to be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors, and similar equipment.
- B. All piping, finished surfaces, and equipment to have all grease, adhesive labels, and foreign materials removed.
- C. All piping to be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, flush valves, and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all liquid strainer screens after the system has been in operation for ten days.
- D. When connections are to be made to existing systems, the Contractor is to do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.

3.7 OPERATION MANUALS, START-UP SERVICE, WARRANTIES, ACCEPTANCE AND GUARANTEES

- A. General: Refer to Section 220500 for details.

END OF SECTION 220501

**PART 1 - GENERAL**

**1.1 APPLICABLE REQUIREMENTS**

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, Section 220500 - Basic Materials and Methods, and other Sections in Division 22 specified herein.

**1.2 SCOPE**

- A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to the following:
  - 1. Pipe and Fittings
    - a. Sanitary waste and vent
    - b. Cold water
    - c. Hot water
    - d. Fuel gas
  - 2. Valves
    - a. Water valves
    - b. LP gas valves
  - 3. Thermometers and gauges
  - 4. Piping specialties
    - a. Pipe escutcheons
    - b. Strainers
    - c. Drip pans
    - d. Air vent
    - e. Dielectric unions
    - f. Unions
    - g. Flanges
    - h. Pipe sleeves
    - i. Sleeve seals
    - j. Valve boxes
    - k. Pipe coating
    - l. Gas connectors

**1.3 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 220500: Basic Materials and Methods
- B. Section 220501: Plumbing
- C. Division 26: Electrical

**1.4 QUALITY ASSURANCE**

- A. Manufacturers Qualifications:
  - 1. Manufactured items furnished shall be the current, cataloged product of the manufacturer.

2. Replacement parts shall be readily available and stocked in the USA.

B. Codes and Standards:

1. All work shall be in full accordance with all applicable codes, ordinances and code rulings.
2. The Contractor shall furnish without any extra charge the labor and material required for compliance of codes.
3. Perform all tests required by governing authorities and as required under all Division 22 Sections. Provide written reports on all tests.
4. Electrical devices and wiring shall conform to the latest standards of NEC; all devices shall be UL listed and so identified.
5. All plumbing work shall comply with the Americans with Disabilities Act (ADA).
6. All excavation work must comply with all provisions of state laws including notification to all owners of underground utilities at least 48 business day hours, but not more than 10 business days, before commencing an excavation.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for all piping, valves and specialties indicating dimensions, valve CV, tolerances etc.
- B. Shop Drawings: Submit shop drawings indicating underground piping installation showing all fittings with inverts. Indicate all footings and grade beams.
- C. Maintenance Data: Submit maintenance instructions on accordance with requirements of Division 01.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish and install all new material, equipment, and apparatus hereinafter specified unless specifically noted otherwise. All material, equipment, and apparatus shall be identified by the manufacturer's name, nameplate, and pertinent data.
  1. All pipe, pipe fittings and valves shall be manufactured in North America. Alternatives may be acceptable, but must be submitted and approved by the Engineer prior to bidding.
  2. test bars, and calculated tensile strength. Certification shall include the legal name and address of the manufacturer.
- B. Type M copper piping is not acceptable for any pressure water piping.
- C. For all Grade B piping specified below grade provide a mill report with production identification numbers for piping submitted to permit tracking of pipe by mill and production lot.
- D. All materials, equipment, and apparatus are mentioned as standards unless noted otherwise. The words "or approved equal" shall be considered to be subsequent to all manufacturer's names used herein, unless specifically noted that substitutes are not allowed.
- E. Products made of, or containing, lead, asbestos, mercury, or other known toxic or hazardous materials are not acceptable for installation under this Section. Any such products installed as



part of the work of this Section shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Contractor(s).

## 2.2 STANDARD PIPE AND FITTING

- A. Liquid Propane (LP) Gas Pipe & Fitting (Above Grade)
  - 1. Pipe: ASTM A53, Schedule 40 black steel.
    - a. Fittings: 150 lb. rating. ANSI B16.3, malleable iron threaded; ANSI B16.5, flanged; ANSI B16.9, steel.
    - b. Joints: 2" and smaller, threaded; all piping inside the building 2-1/2" and larger, ANSI B16.25 bevelweld, ANSI B16.5 flanges, or ANSI B16.11 socket weld.
- B. Liquid Propane (LP) Gas Piping (Below Grade)
  - 1. Polyethylene, Grade 23, Type II, ASTM 2513, plain ends, heat fused joints, orange finish.
- C. Trap Primer Piping:
  - 1. Pipe: Domestic Only, ASTM B88, Type K, soft drawn copper water tube.
  - 2. Fittings: No joints below ground. For pipes below grade double wrap with Scotch Wrap #51 or PASCO Wrap, with 50% overlap.
- D. Domestic Water Pipe & Fittings (Below Grade):
  - 1. Pipe: ASTM B88, Type K hard drawn copper water tube.
  - 2. Fittings: Domestic Only, Elkhart, ANSI B16.22, wrought copper, 95%-5% tin-antimony solder joints. Wrap underground piping with Scotch Wrap or Pasco Wrap.
- E. Domestic Hot and Cold Water Pipe & Fittings (Above Grade):
  - 1. Pipe: ASTM B88, Type L, hard drawn copper water tube.
  - 2. Fittings: ANSI B16.22, wrought copper, 95%-5% tin-antimony solder joints.
- F. Sanitary Sewer, Vent, Rainwater Pipe & Fittings:
  - 1. Pipe: Tyler or AB&I or Charlotte Pipe and Foundry, ASTM A-74, ASTM A-888 cast iron, bituminous coated, "No-Hub". Pipe showing rust or cracks in coating shall be removed and replaced.
  - 2. Fittings: No-hub, ASTM A-888.
  - 3. Couplings Below Grade: Heavy Duty Type 304 stainless steel couplings conforming to FM 1680 with neoprene sealing sleeve conforming to ASTM C-1540 having minimum shield thickness of 28 gauge. Husky SD-4000 or Clamp All 125 only.
  - 4. Couplings Above Grade: Type 304 stainless steel couplings conforming to ASTM C-1540 and neoprene sealing sleeve, having minimum shield thickness of 34 gauge. Anaco or Ideal.
- G. Rainwater Leader Pipe and Fittings (Exposed, Above Grade):
  - 1. Pipe: ASTM B306, DWV class, copper tube.
  - 2. Fittings: ANSI B16.23 cast bronze or ANSI B16.29 wrought copper. Drainage pattern fittings.
  - 3. Joints: Lead free solder. Lead solder shall not be present at the job site.

## 2.3 VALVES: GENERAL

- A. General: Valve ratings shall exceed respective system operating pressures by 50% (minimum). All valves shall be line size unless otherwise noted.

- B. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
- C. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.
- D. Acceptable manufacturers (manufacturer and model number listed for individual valves indicates minimum acceptable by all manufacturers):
  - 1. Gate, Ball, Check or Butterfly: Apollo, Hammond, Nibco (commercial grade, US manufacturer only), Milwaukee, Victaulic or Watts.
  - 2. Lubricated Plug Valves: Homestead, Resun, or Rockwell.
  - 3. Backflow Preventors: Apollo, Ames, Febco, Cla-Val, Watts or Wilkins.
- E. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on the valve body.
- F. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, other than plug valves. Provide one wrench for every 10 plug valves, and one in each size. Provide extended levers/stems for valves on insulated lines. For manual valves 2 1/2" and larger located 8 feet above the floor in mechanical rooms provide chain operator to permit operating the valve from 4'-0" above floor.
- G. Valve Features:
  - 1. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
  - 2. Drain: Comply with MSS SP-45, and provide threaded pipe plugs.
  - 3. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
  - 4. Threaded: Valve ends complying with ANSI B2.1.
  - 5. Solder-Joint: Valve ends complying with ANSI B16.18.
  - 6. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

#### 2.4 DOMESTIC PLUMBING SERVICE VALVES

- A. Gate Valves:
  - 1. 2" and Smaller: Class 125, MSS SP-80, ASTM B62 cast bronze body, soldered ends, bronze bonnet, bronze wedge, rising stem, brass packing gland, non-asbestos packing and aluminum hand-wheel.
- B. Ball Valves:
  - 1. 2 1/2" and Smaller: 600 psi, 2 piece, bronze body, soldered ends for copper pipe and threaded ends for iron pipe, chrome plated brass ball, Teflon seat, brass stem, steel handle, full port. Apollo 70-200 series.
- C. Check Valves:
  - 1. 2" and Smaller: Class 125, MSS SP-80, ASTM B62 and ASTM B16, cast bronze body, soldered ends for copper pipe, screwed cap, swing type, Teflon bronze disc.

## 2.5 LP GAS

## A. Ball Valves:

1. ½" and ¾": Brass body, U.L. listed, CSA approved for pressure of system, bronze ball valve, 175 WOG, with integral lever handle. Apollo 64 series or Watts #FBV-1.

## 2.6 BACKFLOW PREVENTION VALVES

## A. General: All backflow prevention valves shall be State approved and listed.

## B. Double Check Valve for Low Hazard Applications:

1. 2" and Smaller: Assembly shall consist of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies shall include test cocks and two positive seating check valves and shall comply with requirements of ASSE Standard 1015 and AWWA C510. Bronze construction, threaded ends, and stainless steel internal parts. Watts #007-QT-S.

## 2.7 PIPING SPECIALTIES

## A. General:

1. Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or provide proper selection to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is installer's option.

## B. Pipe Escutcheons:

1. Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime zinc base paint finish for unoccupied areas.
2. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide stainless steel, cast brass or sheet brass escutcheons, solid or split hinged.
3. Pipe Escutcheons for Dry Areas: Provide stainless steel escutcheons, solid or split hinged.

## C. Dielectric Unions:

1. Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.

## D. Unions:

1. Unions shall be of type specified in following schedule:
  - a. Black Steel, 2" and smaller: 250 lb. screwed malleable iron, ground joint, brass to iron seat.
  - b. Soldered Copper or Brass Pipe, 2" and smaller: 150 lb. cast bronze or copper, ground joint, non-ferrous seat with soldered ends.
  - c. Manufacturer: EPCO, Mueller, Stanley G. Flagg or Watts.

- E. Sleeve Seals:
1. All sleeves shall be sealed to prevent intrusion of moisture, dust or insects.
  2. Underground: For sleeves passing through exterior or foundation walls, provide mechanical link seal assembly.
  3. Aboveground: For sleeves passing through walls or floors provide a non-toxic 3-hour rated fire resistant silicone foam sealant with a Flame Spread Rating of 20. Sealant to be tested and approved under UL 263, ASTM E119, and NFPA 251 Standards. All fire rated penetrations shall be sealed with approved UL System.
  4. Local Approvals: All seals to be provided shall be in accordance with the regulations of all governing agencies of the city, county, and State Fire Marshal's Office.
- F. Valve Boxes: Concrete body, cast iron cover with vandal resistant screws, extensions as required to extend full depth to valve. Valve box cover lettering shall correspond to the valve service, "Water", "Gas", "Fire", "Sewer", etc. Christy #G8 or equal.

## 2.8 PIPE COATING

- A. All underground steel and copper pipe fittings, and all above ground steel and copper pipe and fittings in corrosive air environments shall be covered with one of the following methods:
1. Twice Wrap 20 Mil. Scotch Wrap PVC No. 51, 50% overlap.
  2. Prefabricated extruded plastic cover with joints sealed with two coats of 20 Mil. Scotch Wrap No. 51 or Pasco Wrap 20 mil weight.
- B. Furnish corrugated stainless steel tubing (CSST) with factory-applied corrosion –resistant polyethylene jacket for use in corrosive atmosphere. Coating properties include the following:
1. Gastite corrugated stainless steel tube jacket shall be UV-Resistant polyethylene meeting the requirements of ASTM E84 for flame spread and smoke density.

## 2.9 GAS CONNECTORS

- A. General Areas: CSA rated, UL listed, braided stainless steel gas hose of size and capacity to meet appliance input requirements.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Workmanship shall be performed by licensed journeymen or master mechanics and shall result in an installation consistent with the best practices of trades.
- B. Install work uniform, level and plumb, in relationship to lines of building. Do not install any diagonal, or otherwise irregular work unless so indicated on Drawings or approved by Architect.

### 3.2 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturers' directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the Drawings or covered in these Specifications.

### 3.3 INSTALLATION

- A. Coordinate the work between the various Plumbing Sections and with the work specified under other Divisions of the work or contracts toward rapid completion of the entire project. If any cooperative work must be altered due to lack of proper supervision or failure to make proper provisions in time, then the work hereunder shall include all expenses of such changes as are necessary in the work under other contracts, and such changes shall be directly supervised by and made to the satisfaction of the Engineer.
- B. The cooperative work not included in the Plumbing Division related to the general construction work is as follows:
  - 1. All formed concrete work.
  - 2. Framed openings in masonry and other Architectural and Structural elements.
  - 3. Wood grounds and nailing strips in masonry and concrete.
  - 4. Sloping of floors to drains and floor sinks.
  - 5. Sloping of roof-to-roof drains and overflow drains.
- C. Inspect all material, equipment, and apparatus upon delivery and do not install any that may be subject to rejection as a result of damage or other defects. Provide tarps and visqueen cover to protect equipment and piping delivered to and stored at the site.

### 3.4 WORKING PRESSURES

- A. All fittings, valves, pipe, specialties equipment shall be rated for the working pressure subjected in the installed locations.
- B. Drawings indicate working pressure in each system. The rating of the equipment and material shall not be less than that of the system pressures.
- C. Low pressure, 0.5 psig (14 inch Water Column) or less, Propane Systems: Use 1/2 to 2-inch NPS: Gastite corrugated stainless steel tube and brass fittings.

### 3.5 PIPES SIZES TO EQUIPMENT

- A. General: Pipe sizes indicated shall be carried full size to equipment served. Any change of size to match equipment connection shall be made within one foot of equipment.
- B. At temperature control valves with sizes smaller than connected lines, reduction shall be made immediately adjacent to valve.

### 3.6 PIPING INSTALLATION

- A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints or couplings, but with adequate and accessible unions for disassembly and maintenance or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ASME B31 Code for Pressure Piping.

- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Where possible, locate insulated piping for 1" clearance outside insulation.

### 3.7 WELDING

- A. Qualifications of Welders: Welders performing work under this Contract shall be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau (NCWB) or by other approved test procedures using methodology and procedures covered in the ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators". Installation shall conform to ANSI 31.1 "Power Piping".
  1. Submit for approval the names, identification, and welder's assigned number, letter or symbol of welders assigned to this project.
  2. The assigned identification symbol shall be used to identify the work of each welder and shall be indelibly stamped immediately upon completion of each weld.
  3. Welders shall be tested and certified for all positions.
  4. Submit identifying stenciled test coupons made by each operator.
  5. Any or all welders may be required to retake welding certification tests without additional expense.
  6. When so requested, a welder shall not be permitted to work as a welder on this project until he has been recertified in accordance with NCWB.
  7. Recertification of the welder shall be made after the welder has taken and passed the required tests.
  8. Where piping 1-1/2 inches and smaller is butt or socket welded, submit 3 samples of test welds for approval.

### 3.8 PIPING SYSTEM JOINTS

- A. All piping shall be cut squarely, free of rough edges and reamed to full bore. Piping shall be mechanically cleaned prior to make-up of joints and fully inserted into fittings.
- B. Provide joints of type indicated in each piping system.
- C. Thread pipe in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
- D. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM B-32, in accordance with IAPMO IS 3-93, ASTM B-828 and Copper Development Association recommended procedures. Joints shall be cleaned by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes shall be applied liberally to the outside of the pipe and the solder cup of the fitting. Fluxes shall be water soluble for copper and brass potable water applications, and shall meet CDA standard test method 1.0 and ASTM B813-91. Solder shall be applied until a full fillet is present around the joint. Solder and flux shall not be applied in

such excessive quantities as to run down interior of pipe. Lead solder or corrosive flux shall not be present at the jobsite.

1. Manufacturers:
  - a. Solder: JW Harris "Bridgit" or Englehard "Silvabrite 100".
  - b. Flux: Laco "Flux-Rite 90", MW Dunton "Nokorode CDA Flux", Hercules "Fluid Action Solder Flux".
- E. Braze copper tube and fitting socket or extrude joints (T-drill) with BCUP series filler metal without flux. Listed brazing flux shall be used for joining of copper tube to brass or bronze fittings and shall meet AWS FB3A or FB3C. Medical gas system brazing shall be as specified in Section 226313. "Shock" cooling is prohibited. A continuous fillet shall be visible around the completed joint. After cooling, flux residue shall be thoroughly removed with warm water and a brush prior to testing. Do not use BCUP filler on copper alloys containing over 10% nickel.
- F. Corrugated stainless steel tube (CSST) fittings joints: Gastite<sup>®</sup> mechanical tube fittings manufactured from ASTM B16 type 360 brass whose design incorporates a double wall flare for gas-tight seal with Jacket Lock<sup>™</sup>, mechanical capture of the jacket for enhanced tubing protection.
- G. Piping shall be capped during construction to prevent entry of foreign material.
- H. Weld pipe joints in accordance with recognized industry practice and as follows:
  1. Weld pipe joints only when ambient temperature is above 0°F.
  2. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles, and dirt.
  3. Use pipe clamps or tack-weld joints with 1" long welds, 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".
  4. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and at edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes, and non-metallic inclusions.
  5. Do not weld out piping system imperfections by tack-welding procedures. Refabricate to comply with requirements.
  6. At Installer's option, install forged branch-connection fittings whenever branch pipe is indicated, or install regular T-fitting.
- I. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
- J. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.

### 3.9 VALVES

- A. General: Except as otherwise indicated, comply with the following requirements:
  1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided as necessary.
  2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane without prior written approval. Install

- valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
3. All valves mounted higher than 7' above floor in mechanical rooms and where indicated shall be installed with stem horizontal and equipped with chain wheels and chains extending to 6' above floor.
- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends of types of pipe/tube connections:
1. Copper Pipe, 2-1/2" and Smaller: Soldered-joint valves.
  2. Steel Pipe, 2" and Smaller: Threaded joint valves.
- D. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- E. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- F. Fluid Control: Except as otherwise indicated, install gate, ball, plug, circuit setter, globe, and butterfly valves to comply with ASME B31.9.
- G. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
- H. Wafer Check: Install between 2 flanges in horizontal or vertical position.
- I. Ball Valve: Ball valve used on gas systems shall be UL listed, CSA approved for pressure of system, no exception.
- J. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- K. Valve Identification: Tag each valve in accordance with "Mechanical Identification" section.
- L. Cleaning: Clean factory-finished surfaces. Repair marred or scratched surfaces with manufacturer's touch-up paint.

### 3.10 PIPE INSPECTIONS

- A. It is the intent of the Contract Documents that systems be inspected at completion of each phase while under tests required for administrative authorities, and prior to concealment, i.e. "Rough-in" "top-out" and final.
- B. Inspection – Below Grade: All piping installed below grade shall be inspected prior to burial by the Architect, the Owner's Representative or the Engineer. Contractor must notify Architect no less than 24 working hours prior to inspection time. Should the piping be buried prior to inspection the contractor may be requested to uncover the piping at no delay to the project and at no additional cost to the Owner.



- C. Inspection – Above Grade: All piping installed above grade shall be made available for inspection upon completion and prior to finish of walls and ceilings. Notify the Architect, the Owner’s Representative or the Engineer. Contractor must notify Architect no less than 24 working hours prior to the desired inspection time. Should the piping be hidden within the structure prior to inspection the contractor may be requested to uncover the piping at no delay to the project and at no additional cost to the Owner.

**3.11 CLEANING, FLUSHING, DISINFECTING**

- A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any).
- B. Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports, and accessory items.
- C. Inspect pressure piping in accordance with procedures of ASME B31.
- D. Disinfect water mains and water service piping in accordance with Section 220501.

**3.12 TESTING**

- A. Provide all tests specified hereinafter and as otherwise required. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Test all rotational equipment for proper direction of rotation. Upon completion of testing, certify to the Architect, in writing, that the specified tests have been performed and that the installation complies with the specified requirements and provide a report of the test observations signed by qualified inspector.
- B. Piping: Remove from the system, during testing, all equipment which would be damaged by test pressure. Replace removed equipment when testing has been accomplished. The system may be tested in sections as the work progresses; however, any previously tested portion shall become a part of any latter test of a composite system. Correct leaks by remaking joints with new material.
- C. Test time will be accrued only while full test pressure is on the system, unless indicated otherwise. “Tolerance” shall be no pressure drop, except that due to temperature change in a 24-hour period. Inspect and test all work prior to burying or concealing. Test pressure shall be one and one-half times the system operating pressure or the listed test pressure below, whichever is greater:

System	Test Medium	Test Pressure	Tolerance-Test Period
Domestic Water	Water	80 psig	None – 8 hours
Soil and Waste	Water	10 ft head, 5 psi	No leaks – 8 hours
Vent	Water	Top of Vent Terminal	No leaks – 8 hours
Storm	Water	Top of Roof Drain	No leaks – 8 hours
Propane	Air or Nitrogen	100 psig	None – 24 hours

- D. Final Drainage, Waste and Vent Test: Upon project closeout, Contractor shall perform and certify that the DWV system has passed the following test:
  1. After all plumbing fixtures have been installed and their traps filled with water, all vent terminals and building drains shall be closed and a U-tube water manometer shall be

inserted into the trap of water closet and an air compressor testing apparatus shall be attached to any suitable opening. An air pressure of 1" water column as indicated on the manometer shall be introduced into the system. The pressure shall hold constant for a period of 15 minutes without the introduction of additional air. Leaks revealed during this test may be located by smoke test or other recognition methods.

- E. Valves: Test all valve bonnets for tightness. Test operate all valves at least once from closed-to-open-to-closed position while valve is under test pressure. Test all automatic valves, including solenoid valves, and temperature and pressure relief valves, safety valves, and temperature and pressure relief valves not less than three (3) times.
- F. Piping Specialties: Test all thermometers, pressure gauges, and water meters for accurate indication; automatic water feeders, air vents, trap primers, and vacuum breakers for proper performance. Test all air vent points to ensure that all air has been vented.
- G. Backflow Preventers: Each testable backflow prevention device shall be tested and approved by certified testers after installation. Submit test results.

END OF SECTION 222113

**PART 1 - GENERAL****1.1 APPLICABLE REQUIREMENTS**

- A. All work under this Section shall comply with the drawings and general provisions of the Contract Documents, including Division 01 - General Requirements, and shall include all Mechanical Sections specified herein.

**1.2 SCOPE OF THIS SECTION**

- A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
1. Compliance with all codes and standards applicable to this jurisdiction.
  2. Shop Drawings for Equipment
  3. Coordination Documents
  4. Record Drawings
  5. Start-up Service
  6. Instruction, Maintenance, and O & M Manuals
  7. Work associated with Delivery, Storage, and Handling of products
  8. Preparation of Posted Operating Instructions
  9. Meeting Project Safety and Indemnity requirements
  10. Proper Cleaning and Closing
  11. Supplying proper Warranty information
  12. Supply specified Guarantee documentation
  13. Design and provision of Supports and Anchors
  14. Identification Markers
  15. Coordination of Electrical requirements for equipment provided

**1.3 DESCRIPTION OF WORK**

- A. The Contract Documents, including Specifications and Construction Drawings, are intended to provide all material and labor to install complete heating system for the building.
- B. The Contractor shall refer to the architectural interior details, floor plans, elevations, and the structural and other Contract Drawings and he shall coordinate his work with that of the other trades to avoid interference. The plans are diagrammatic and show generally the locations of the fixtures, equipment, and pipe lines and are not to be scaled; all dimensions and existing conditions shall be checked at the building.
- C. The Contractor shall comply with the project closeout requirements as detailed in General Requirements of Division 01.
- D. Where project involves interface with existing building and site systems, every effort has been made to note existing utilities and services. However, the Contractor should thoroughly familiarize themselves with existing conditions and be aware that in some cases information is not available as to concealed conditions, which exist in portions of the existing building affected by this work.

## 1.4 DESCRIPTION OF BID DOCUMENTS

- A. Specifications:
  - 1. Specifications, in general, describe quality and character of materials and equipment.
  - 2. Specifications are of simplified form and include incomplete sentences.
  
- B. Drawings:
  - 1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and methods of installation.
  - 2. Before proceeding with work check and verify all dimensions.
  - 3. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
  - 4. Make adjustments that may be necessary or requested, in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
  - 5. If any part of Specifications or Drawings appears unclear or contradictory, apply to Architect or Engineer for his interpretation and decision as early as possible, including during bidding period.

## 1.5 DEFINITIONS

- A. "Above Grade": Not buried in the ground and not embedded in concrete slab on ground.
- B. "Accessible": Ability to perform recommended maintenance without removal of services or equipment and requiring no special platforms.
- C. "Actuating" or "Control" Devices: Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.
- D. "Below Grade": Buried in the ground or embedded in concrete slab on ground.
- E. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures. In general, any item not visible or directly accessible.
- F. "Connect": Complete hook-up of item with required service.
- G. "Exposed": Not installed underground or "concealed."
- H. "Furnish": To supply equipment and products as specified.
- I. "Indicated," "Shown" or "Noted": As indicated, shown or noted on Drawings or Specifications.
- J. "Install": To erect, mount and connect complete with related accessories.
- K. "Motor Controllers": Manual or magnetic starters (with or without switches), individual push buttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- L. "Piping": Pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.

- M. "Provide": To supply, install and connect as specified for a complete, safe and operationally ready system.
- N. "Reviewed," "Satisfactory" or "Directed": As reviewed, satisfactory, or directed by or to Architect/Engineer/Owner.
- O. "Rough-In": Provide all indicated services in the necessary arrangement suitable for making final connections to fixture or equipment.
- P. "Shall": An exhortation or command to complete the specified task.
- Q. "Similar" or "Equal": Of base bid manufacture, equal in materials, weight, size, design, and efficiency of specified products.
- R. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
- S. "Typical" or "Typ": Exhibiting the qualities, traits, or characteristics that identify a kind, class, number, group or category. Of or relating to a representative specimen. Application shall apply to all other similarly identified on plan or detail.
- T. "Will": A desire to complete the specified task. Allows some flexibility in application as opposed to "Shall."
- U. "Wiring": Raceway, fittings, wire, boxes and related items.
- V. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

#### 1.6 RELATED WORK SPECIFIED ELSEWHERE

- A. All Division 23 Mechanical sections included herein.
- B. Division 07: Thermal and Moisture Protection.
  - 1. Flashing and sheet metal.
  - 2. Sealants and caulking.
  - 3. Firestopping.
- C. Division 09: Painting:
  - 1. Division 23 installers shall perform all painting, except where specifically stated otherwise in Division 09.
- D. Division 26: Electrical is related to work of:
  - 1. Power connections to all mechanical equipment.
- E. Division 28: Electronic Safety and Security is related to work of:
  - 1. Fire protection alarms and relays.
  - 2. Smoke detector and monitoring.
  - 3. Life Safety Systems.

## 1.7 CODES AND STANDARDS

- A. The Contractor is cautioned that code requirements not explicitly detailed in these specifications or drawings, but which may be reasonably inferred or implied from the nature of the project, must be provided as part of the contract.
- B. Perform all tests required by governing authorities and required under all Division 23 Sections. Provide written reports on all tests.
- C. Electrical devices and wiring shall conform to the latest standards of NEC; all devices shall be UL listed and labeled.
- D. All mechanical work shall comply with the Americans with Disabilities Act (ADA).
- E. Provide in accordance with rules and regulations of the following:
  - 1. Building Codes enforced by the Authority Having Jurisdiction in California:
    - a. 2010 California Building Code (CBC) based 2009 International Building Code (IBC) with State Amendments.
    - b. 2010 California Mechanical Code (CMC) based 2009 Uniform Mechanical Code (UMC) with State Amendments.
    - c. 2010 California Plumbing Code (CPC) based 2009 Uniform Plumbing Code (UPC) with State Amendments.
    - d. 2010 California Fire Code (CFC) based 2009 International Fire Code (IFC) with State Amendments.
    - e. 2010 California Electric Code (CEC) based 2008 National Electric Code with State Amendments.
    - f. 2008 Title 24, Part 6 California Energy Efficiency Standards for Residential and Nonresidential Buildings
  - 2. Local, city, county and state codes and ordinances.
  - 3. Local Health Department.
  - 4. Local and State Fire Prevention Districts.
  - 5. State Administrative Codes.
- F. Provide in accordance with appropriate referenced standards of the following:
  - 1. NFPA - National Fire Protection Association.
  - 2. AABC - Associated Air Balance Council.
  - 3. CSA - Canadian Standards Association.
  - 4. ADC - Air Diffuser Council.
  - 5. AMCA - Air Moving and Conditioning Association.
  - 6. ANSI - American National Standards Institute.
  - 7. ARI - Air Conditioning and Refrigeration Institute.
  - 8. ASHRAE - American Society of Heating, Refrigerating & Air Conditioning Engineers.
  - 9. ASME - American Society of Mechanical Engineers.
  - 10. ASTM - American Society for Testing Materials.
  - 11. AWS - American Welding Society.
  - 12. FM - Factory Mutual.
  - 13. MSS - Manufacturer's Standardization Society.
  - 14. NEMA - National Electrical Manufacturer's Association.
  - 15. SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
  - 16. UL - Underwriter's Laboratories.
  - 17. ADA - Americans with Disabilities Act.
  - 18. ETL - Electrical Testing Laboratories.

**1.8 QUALITY ASSURANCE**

- A. **Manufacturer's Nameplates:** Nameplates on manufactured items shall be aluminum or Type 304 stainless steel sheet, not less than 20 USG (0.0375"), riveted or bolted to the manufactured item, with nameplate data engraved or punched to form a non-erasable record of equipment data.
- B. **Current Models.** All work shall be as follows:
  - 1. Manufactured items furnished shall be the current, cataloged product of the manufacturer.
  - 2. Replacement parts shall be readily available and stocked in the USA.
- C. **Experience:** Unless more stringent requirements are specified in other sections of Division 23, manufactured items shall have been installed and used, without modification, renovation or repair, on other projects for not less than one year prior to the date of bidding for this project.

**1.9 GENERAL REQUIREMENTS**

- A. Examine all existing conditions at building site.
- B. Review contract documents and technical specifications for extent of new work to be provided.
- C. Provide and pay for all permits, licenses, fees and inspections.
- D. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. This work shall include furnishing and installing all access doors required for mechanical access.
- E. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to Equipment Specifications in Divisions 02 through 16 for rough-in requirements.
- F. Coordinate mechanical equipment and materials installation with other building components.
- G. Verify all dimensions by field measurements.
- H. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- I. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- J. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials. Contractor to provide for all cutting and patching required for installation of his work unless otherwise noted.
- K. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

- L. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, without interference with other installations.
- M. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- N. Coordinate with Owner in advance to schedule shutdown of existing systems to make new connections. Provide valves in new piping to allow existing system to be put back in service with minimum down time.
- O. All materials (such as insulation, ductwork, piping, wiring, controls, etc.) located within air occupied spaces shall have a flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA 255) Method. In addition, the products, when tested, shall not drip flame particles, and flame shall not be progressive. Provide Underwriters Laboratories, Inc., label or listing, or satisfactory certified test report from an approved testing laboratory to prove the fire hazard ratings for materials proposed for use do not exceed those specified.
- P. Products made of or containing lead, asbestos, mercury or other known toxic or hazardous materials are not acceptable for installation under this Division. Any such products installed as part of the work of the Division shall be removed and replaced and all costs for removal and replacement shall be borne solely by the installing Contractor.

#### 1.10 MINOR DEVIATIONS

- A. The Drawings are diagrammatic and show the general arrangements of all mechanical work and requirements to be performed. It is not intended to show or indicate all offsets, fittings, and accessories which will be required as a part of the work of this Section.
- B. The Contractor shall review the structural and architectural conditions affecting his work. It is the specific intention of this section that the contractor's scope of work shall include
  1. Proper code complying support systems for all equipment whether or not scheduled or detailed on drawings or in these specifications
  2. Minor deviations from the mechanical plans required by architectural and structural coordination.
- C. The Contractor shall study the operational requirements of each system, and shall arrange his work accordingly, and shall furnish such fittings, offsets, supports, accessories, as are required for the proper and efficient installation of all systems from the physical space available for use by this section. This requirement extends to the Contractor's coordination of this section's work with the "Electrical Work." Should conflicts occur due to lack of coordination, the time delay, cost of rectification, demolition, labor and materials, shall be borne by the Contractor and shall not be at a cost to the Owner.
- D. Minor deviations in order to avoid conflict shall be permitted where the design intent is not altered.
- E. Advise the Architect, in writing, in the event a conflict occurs in the location or connection of equipment. Bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Architect of conflict.



**1.11 PRODUCT SUBSTITUTIONS**

- A. The Contractor shall certify the following items are correct when using substituted products other than those scheduled or shown on the drawings as a basis of design:
  - 1. The proposed substitution does not affect dimensions shown on drawings.
  - 2. The Contractor shall pay for changes to building design, including engineering design, detailing, structural supports, and construction costs caused by proposed substitution.
  - 3. The proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
  - 4. Maintenance and service parts available locally are readily obtainable for the proposed substitute.
- B. The Contractor further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.
- C. The Contractor agrees that the terms and conditions for the substituted product that are found in the contract documents apply to this proposed substitution.

**1.12 EQUIPMENT SUBMITTALS**

- A. Prior to construction submit for review all materials and equipment in accordance with Division 01 requirements.
- B. Submittals shall be submitted as a complete package bound in a 3-ring binder with tabs for each specification section. The approved submittals shall be converted into Operations & Maintenance Manuals at the completion of the project. Submit six (6) typed copies of submittals. Refer to Division 01 for additional requirements.

**1.13 RECORD DRAWINGS**

- A. Before commencing installation, obtain an extra set of prints from Architect, marked "Record." Keep this set of Drawings at the job site at all times, and use it for no other purpose but to mark on it all the changes and revisions to the Contract Drawings resulting from coordination with other trades. At the completion of the project,
  - 1. Obtain a clean set of reproducible from the Architect or Engineer, at cost plus, and transfer the revisions to these reproducible in a neat and orderly fashion.

OR

- 2. Edit project AutoCAD files to incorporate all site markups, changes, and revisions to the Contract Drawings. Submit plots of Record Drawings and six copies CD Roms labeled with all record AutoCAD drawing files.
- B. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.
- C. Refer also to Special Conditions in Division 01 for full scope of requirements.

**1.14 START-UP SERVICE AND BUILDING COMMISSIONING**

- A. Prior to start-up, be assured that systems are ready, including checking the following: Proper equipment rotation, proper wiring, auxiliary connections, lubrication, venting, controls, and installed and properly set relief and safety valves.
- B. Refer to other Division 23 Sections for additional requirements.

**1.15 INSTRUCTION, MAINTENANCE, AND O&M MANUALS**

- A. O&M Manuals: Upon completion of the work, and prior to training of Owner's personnel, the Contractor shall submit to the Architect complete set of operating instructions, maintenance instructions, part lists, and all other bulletins and brochures pertinent to the operation and maintenance for equipment furnished and installed as specified in this section, bound in a durable binder. Refer to Division 01.
- B. Contractor shall be responsible for providing proper instruction of the of Owner's personnel for operation and maintenance of equipment, and apparatus installed as specified in Division 23 to be no less than two hours for each piece of equipment. The Contractor shall develop and submit training materials prior to this training. These materials shall include qualifications of the trainer, training agenda, learning objectives, and a written test to be administered at the end of the training session. Operation and Maintenance manuals must present, incorporated and referenced in the training sessions.

**1.16 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials in an environmentally controlled area at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage. Piping shall be stored in bundles covered with visqueen. Piping showing signs of rust shall be removed from site and replaced.
- C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

**1.17 SAFETY AND INDEMNITY**

- A. The Contractor shall be solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal hours of work.
- B. No act, service, Drawing, review, or Construction Review by the Owner, Architect, the Engineers or their consultants, is intended to include the review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

- C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify and defend the Owner, the Architect, the Engineers and their consultants, and each of their officers, employees and agents from any and all liability claim, losses or damage arising, 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 the 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 the sole negligence of the Owner, the Architect, the Engineers, and their consultants or their officers, employees and agents.

#### 1.18 CLEANING AND CLOSING

- A. All work shall be inspected, tested, and approved before being concealed or placed in operation.
- B. Upon completion of the work, all equipment installed as specified in this section, and all areas where work was performed, shall be cleaned to provide operating conditions satisfactory to the Architect.

#### 1.19 WARRANTIES

- A. All equipment shall be provided with a minimum one-year warranty to include parts and labor. Refer to individual Equipment Specifications for extended or longer-term warranty requirements.
- B. Provide complete warranty information for each item, to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.
- C. Service during warranty period: Contractor shall provide maintenance as specified elsewhere during the 12-month warranty period.

#### 1.20 GUARANTEE

- A. The Contractor shall guarantee and service all workmanship and materials to be as represented by him and shall repair or replace, at no additional cost to the Owner, any part thereof which may become defective within the period of one (1) year after the Date of Final Acceptance, ordinary wear and tear excepted.
- B. Contractor shall be responsible for and pay for any damages caused by or resulting from defects in his work.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Furnish and install all new material, equipment, and apparatus hereinafter specified unless specifically noted otherwise. All material, equipment, and apparatus shall be identified by the manufacturer's name, nameplate, and pertinent data.

- B. All materials, equipment, and apparatus are mentioned as standards unless noted otherwise. The words "or approved equal" shall be considered to be subsequent to all manufacturers' names used herein, unless specifically noted that substitutes are not allowed.

## 2.2 SUPPORTS AND ANCHORS

- A. General: Comply with applicable codes pertaining to product materials and installation of supports and anchors, including, but not limited to, the following:
  1. UL and FM Compliance: Provide products, which are UL listed and FM approved.
  2. ASCE 7-05: "American Society of Civil Engineers."
  3. 2006 International Building Code (IBC)
  4. MSS Standard Compliance: Manufacturer's Standardization Society (MSS).
  5. SMACNA: "Seismic Restraint Manual: Guidelines for Mechanical Systems."
  6. NFPA: Pamphlet number 13 and 14 for fire protection systems.
  7. Provide copper plated or plastic coated supports and attachment for copper piping systems. Field applied coatings or tape is unacceptable.
  8. Manufacturer: B-Line, Grinnell, Michigan, Tolco, Kin-Line, Simpson, or Superstrut.

## 2.3 IDENTIFICATION MARKERS

- A. Mechanical Identification Materials: Provide products of categories and types required for each application as referenced in other Division 23 Sections. Where more than single type is specified for application, selection is installer's option, but provide single selection for each product category. Stencils are not acceptable.
- B. Plastic Equipment Signs:
  1. Provide 4-1/2" x 6" plastic laminate sign, ANSI A.13 color coded with engraved white core lettering.
  2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
  3. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
- C. Acceptable Manufacturers: Craftmark, Seton, Brady, Marking Services, Inc., or Brimar.

## 2.4 ELECTRICAL

- A. General:
  1. All electrical material, equipment, and apparatus specified herein shall conform to the requirements of Division 26.
- B. Quality Assurance:
  1. Electrical components and materials shall be UL or ETL listed/labeled as suitable for location and use - no exceptions.
- C. Low Voltage Control Wiring:
  1. General: 14 gauge, Type THHN, color coded, installed in conduit.

2. Manufacturer: General Cable Corp., Alcan Cable, American Insulated Wire Corp., Senator Wire and Cable Co., or Southwire Co.
- D. Disconnect Switches:
  1. Non-Fusible Switches: For equipment less than 1/2 horsepower, switch shall be horsepower rated; toggle switch type with thermal overload quantity of poles and voltage rating as required.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Workmanship shall be performed by licensed journeymen or master mechanics and shall result in an installation consistent with the best practices of trades.
- B. Install work uniform, level and plumb, in relationship to lines of building. Do not install any diagonal, or otherwise irregular work unless so indicated on Drawings or approved by Architect.

#### 3.2 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturers' directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the Drawings or covered in these Specifications.
  1. If the contractor must deviate from the manufacturer's recommendations provide a letter from the manufacturer indicating the clearance to be provided is acceptable for scheduled performance and maintenance.

#### 3.3 INSTALLATION

- A. Coordinate the work between the various Mechanical Sections and with the work specified under other Divisions. If any cooperative work must be altered due to lack of proper supervision or failure to make proper and timely provisions, the alternations shall be made to the satisfaction of the Engineer and at the Contractor's cost. Coordinate wall and ceiling work with the General Contractor, and his subcontractors in locating ceiling air outlets, wall registers, etc.
- B. Inspect all material, equipment, and apparatus upon delivery and do not install any damaged or defected materials.

#### 3.4 SUPPORTS AND HANGERS

- A. Prior to installation of hangers, supports, anchors, and associated work, installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives, (if any), installers of other work with requirements specified.
- B. Installation of Building Attachments: Install building attachments at required locations on structural steel for proper support. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

- C. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including, but not limited to, proper placement of inserts, anchors, and other building structural attachments.
- D. Adjusting:
  - 1. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
  - 2. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
  - 3. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

### 3.5 ELECTRICAL REQUIREMENTS

- A. Mechanical Contractor shall coordinate with Division 26 work to provide complete systems as required to operate all mechanical devices installed under this Division of work.
- B. Installation of Electrical Connections: Furnish, install, and wire (except as may be otherwise indicated) all heating equipment and controls in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC, and NECA's "Standard of Installation" to ensure that products fulfill requirements. Carefully coordinate with work performed under the Mechanical Division of these Specifications.

### 3.6 PAINTING

- A. All painting shall be provided under this Division work, unless otherwise specified under Section 099100: Painting. Painting schemes shall comply with ANSI A13.1. Paint all exposed materials such as piping, ductwork, equipment, insulation, steel, etc. Exposed gas piping inside and outside the building shall be painted with two coats of "Rust-O-Leum" Yellow.
- B. All exposed work under Division 23 shall receive either a factory finish or a field prime coat finish, except:
  - 1. Exposed copper piping.

### 3.7 IDENTIFICATION MARKERS

- A. General: Where identification is to be applied to surfaces which require insulation, painting, or other covering install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. Mechanical Equipment Identification: Locate engraved plastic laminate signs on or near each major item of mechanical equipment and each operational device. Provide signs for the following:
  - 1. Unit heater.
  - 2. Thermostat

**3.8 TESTING**

- A. Provide all tests specified hereinafter and as otherwise required. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Test all rotational equipment for proper direction of rotation. Upon completion of testing, certify to the Architect, in writing, that the specified tests have been performed and that the installation complies with the specified requirements and provide a report of the test observations signed by qualified inspector.
  
- B. Temperature Control: Test all control functions to assure that all systems are controlling as specified or as otherwise necessary and that all controls are adjusted to maintain proper room temperatures.

END OF SECTION 230500

## PART 1 - GENERAL

## 1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, and Section 230500 - Basic Materials and Methods, and other Sections in Division 23 specified herein.

## 1.2 SCOPE

- A. All work to be furnished and installed under this Section shall include, but not necessarily be limited to, providing insulation for the following:
  - 1. Piping:
    - a. Hot water piping.
    - b. Valves, pumps, air separators, strainers and fittings in insulated piping systems.
- B. Types of mechanical insulation specified in this Section include the following:
  - 1. Fiberglass pipe insulation.
  - 2. Cellular glass pipe insulation.
  - 3. Calcium silicate pipe insulation.
  - 4. Flexible elastomeric closed cell insulation
  - 5. Insulation jackets.
  - 6. Insulation accessories.

## 1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 220501: Plumbing.
- B. Section 230500: Basic Materials and Methods.
- C. Section 222113: Plumbing Piping

## 1.4 DEFINITIONS

- A. Ambient: The air temperature to be maintained in a conditioned room. Typically between 70°F and 78°F.
- B. Insert: Spacer placed between the pipe support system and the piping to allow for the space required for insulation.
- C. Insulation Group (IG): Definition of Insulation Materials and Operating Temperatures.
- D. Insulation Shield: Buffer material placed between the pipe support system and the insulation to prevent the insulation material from crushing.
- E. Jacket: Protective covering over the pipe insulation; may be factory applied such as "all service jacket" or field applied to provide additional protection; of such materials as canvas, PVC, aluminum or stainless steel.



- F. Piping Insulation: Thermal insulation applied to prevent heat transmission to or from a piping system.
- G. Vapor Barrier Jacket: Insulation jacket material that impedes the transmission of water vapor.
- H. Freezing Climate: Where outdoor design temperature is less than 33° F, as stated in ASHRAE fundamentals under 99% column for winter design conditions.

## 1.5 QUALITY ASSURANCE

- A. Codes and Standards: Provide products conforming to the requirements of the following:
  - 1. American Society for Testing and Materials (ASTM): Manufacture and test insulation in accordance with the ASTM Standards, including:
    - a. B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plat.
    - b. C165 - Recommended Practice for Measuring Compressive Properties of Thermal Insulation.
    - c. C167 - Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
    - d. C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission.
    - e. Properties by Means of the Guarded-Hot-Plate Apparatus.
    - f. C195 - Specification for Mineral Fiber Thermal Insulating Cement.
    - g. C196 - Specification for Expanded or Exfoliated Vermiculite Thermal Insulating Cement.
    - h. C302 - Test Method for Density of Preformed Pipe-Covering-Type Thermal Insulation.
    - i. C303 - Test Method for Density of Preformed Block-Type Thermal Insulation.
    - j. C305 - Test for Thermal Conductivity of Pipe Insulation.
    - k. C356 - Test for Linear Shrinkage of Preformed High-Temperature Thermal Insulation.
    - l. C411 - Test for Hot-Surface Performance of High Temperature Thermal Insulation.
    - m. C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
    - n. C449 - Specification of Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
    - o. C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
    - p. C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.
    - q. C534 - Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
    - r. C547 - Specification for Mineral Fiber Preformed Pipe Insulation.
    - s. C552 - Specification for Cellular Glass Block and Pipe Thermal Insulation.
    - t. C553 - Specification for Mineral Fiber Blanket-Type Pipe Insulation (Industrial Type).
    - u. C592 - Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered).
    - v. C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
    - w. C916 - Standard Specification for Adhesives for Duct Thermal Insulation.
    - x. C921 - Practice for Determining Properties of Jacketing Materials for Thermal Insulation.
    - y. C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
    - z. C1071 - Standard Specification for Thermal and Acoustical Insulation.
    - aa. C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings..

- bb. E84 - Test Method for Surface Burning Characteristics of Building Materials.
  - cc. E119 - Test for Fire Resistance.
  - dd. G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
  - ee. G22 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Bacteria.
- 2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): Provide and install pipe and duct insulation in accordance with the following ASHRAE Standard:
    - a. 90 Energy Conservation in New Building Design.
  - 3. National Fire Protection Association (NFPA): Manufacture insulation in accordance with the following NFPA standards:
    - a. 255 Test Methods, Surface Burning Characteristics of Building Materials.
- B. Do not provide materials with flame proofing treatments subject to deterioration due to the effects of moisture or high humidity.
  - C. Flame/Smoke Rating: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA 255) Method. In addition, the products, when tested, shall not drip flame particles, and flame shall not be progressive. Provide Underwriters Laboratories, Inc., label or listing; or satisfactory certified test report from an approved testing laboratory to prove the fire hazard ratings for materials proposed for use do not exceed those specified.
  - D. Insulation thickness shall be the greater standard of that specified here or the State energy conservation requirements.

#### 1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, K-value, thickness, and furnished accessories for each mechanical system requiring insulation. Also furnish necessary test data certified by an independent testing laboratory. Submit samples.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product in maintenance manual.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coating to the site in containers with manufacturer's stamp or label affixed showing fire hazard indexes of products.
- B. Store and protect insulation against dirt, water, chemical, and mechanical damage. Do not install damaged or wet insulation; remove from project site.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Johns Manville, Owens-Corning, Knauf, Armstrong, Pittsburgh-Corning, Certainteed, Halstead, Rubatex, 3M FireMaster, Pabco, Reflectix, or approved equal. Manufacturer and insulation types listed below indicate a minimum acceptable level of quality required for each classification.

## 2.2 PIPE INSULATIONS

- A. Glass Fiber: Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547 and meet ASTM C 585 for sizes required in the particular system.
1. Non-Wicking:
    - a. Manufacturers:
      - 1) Johns Manville Micro-Lok Meeting ASTM C547; or Micro-Flex (pipe sizes larger than 18")
      - 2) Knauf
      - 3) insulation
    - b. Applications: Insulation of piping up to 18" in diameter and 3" thick insulation.
    - c. 'K' Value: 0.23 at 75°F.
    - d. Maximum Service Temperature: 850°F.
    - e. Vapor Retarder Jacket: AP-T PLUS white kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self sealing longitudinal laps and butt strips or AP jacket with outward clinch expanding staples or vapor barrier mastic as needed.
  - B. Field Applied Jackets:
    1. All longitudinal seams, on horizontal pipe runs, shall be installed on the bottom of pipes.
    2. Aluminum Jacket: 0.016" (minimum) thick sheet, [smooth/embossed] finish, with longitudinal slip joints and 2" laps, die shaped fitting covers with factory attached protective liner.
    3. Stainless Steel Jacket: Type 304 stainless steel, 0.010" minimum (smooth/corrugated) finish.
    4. Secure stainless steel or aluminum jackets with 3/8" or 1/2" stainless steel bands on 12" centers.
    5. Manufacturers: Pabco, Childers, RPR, or approved equal.
  - C. Removable Covers:
    1. Provide removable covers on valves, air separators, vents, fittings, flanges, strainers, traps, etc., where periodic maintenance or removal of insulation may be required.
    2. Use of premolded fittings with PVC covers is acceptable.
    3. Use of lace-on type insulating blankets is acceptable.

## PART 3 - EXECUTION

## 3.1 EXAMINATION AND PREPARATION

- A. Verify that piping and ductwork has been tested for leakage in accordance with specifications before applying insulation materials. All piping and ductwork shall be inspected by Owner's Representative prior to installation of insulation. Any insulation applied prior to inspection shall

be removed and new insulation applied at no additional cost to Owner. Notify Owner's Representative five (5) working days prior to insulation installation.

- B. Verify that all surfaces are clean, dry and free of foreign material.

**3.2 INSTALLATION**

**A. General:**

1. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
2. Remove and replace any insulation that has become wet or damaged during the construction process.
3. Continue insulation and vapor barrier at penetrations and duct supports, except where prohibited by code. Instances where this is required include:
  - a. Ductwork support angle or struts. To prevent crushing of low density insulation, provide separator or high density insulation at point of support. Vapor barrier to continue unbroken at point of support.

**B. Piping Insulation:**

1. Locate insulation and cover seams in least visible locations unless otherwise specified.
2. Neatly finish insulation at supports, protrusions, and interruptions.
3. For insulated pipes conveying fluids above ambient temperature, secure jackets with self sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions.
4. Use of metal saddles is acceptable as specified in Section 220500. Fill interior voids with segments of insulation matching adjoining pipe insulation.
5. Use of pipe hangers designed as an insulation coupling is acceptable in lieu of saddles and other devices. Klo-Shure coupling or equal.
6. For pipe exposed in mechanical equipment rooms or in finished spaces below 7 feet above finished floor, finish with Johns Manville Zeston 2000 PVC jacket and fitting covers, or aluminum or stainless steel jacket.
7. When maintenance or service access for equipment will result in foot traffic over floor mounted insulated piping the contractor is to fabricate a permanent removable walkway to prevent damage to the piping and insulation.

**3.3 PIPING INSULATION SCHEDULE**

- A. All insulation thicknesses shall meet or exceed state energy code requirements as noted below. Increase thickness 1/2" if exposed to exterior ambient air. Minimum thermal resistance in range of 4.2 to 4.6 per inch of thickness. Insulation thicknesses are based on fiberglass insulation and may be adjusted for equivalent insulation values for materials with superior "K" factors.

**B. Fiberglass Insulation**

	PIPE SIZE (inches)	THICKNESS (inches)	REMARKS
Heating water supply and return systems and fittings	Up to 2 2 1/2 and over	1 1/2 2	

END OF SECTION 230700

## GENERAL

## 1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this Section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, Section 230500 - Basic Materials and Methods, and other Sections in Division 23 specified herein.

## 1.2 SCOPE

- A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
  - 1. Flashings
  - 2. Bird Screens
  - 3. Louvers

## 1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 230500: Basic Materials and Methods
- B. Section 230593: Testing, Adjusting and Balancing
- C. Division 26: Electrical

## 1.4 QUALITY ASSURANCE

- A. Codes and Standards: Provide products conforming to the requirements of the following:
  - 1. ARI 885-98 "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminal and Air Outlets."
  - 2. AMCA-210 - Laboratory Methods of Testing Fans for Rating Purposes.
  - 3. ANSI S1.23 - Designation of Sound Power Emitted by Machinery and Equipment.
  - 4. ASC-A7001 - Standard for Duct Sealants.
  - 5. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip. Type 304 or 304 stainless steel.
  - 6. ASTM A525 - Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) Hot-Dip Process. G90 zinc-coated.
  - 7. ASTM A527/A527M - Standard Specification for Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
  - 8. TIMA AAC-101 - Standard for fiberglass duct liner with erosion proof facing.
  - 9. UL 181 - Factory-Made Air Ducts and Connections, Class 1.
- B. Conform to NFPA 90A "Standards for the Installation of Air Conditioning and Ventilating Systems".
- C. All equipment shall be seismically supported and braced per the SMACNA "Seismic Restraint Manual: Guidelines for Mechanical Systems".

## 1.5 SUBMITTALS

- A. Prior to construction, submit for approval on all materials and equipment:
  - 1. Flashings
  - 2. Bird Screens
  - 3. Louvers
- B. The contractor must comply with the enclosed specification in its entirety. If on inspections, the specifier finds changes have been made without prior approval, the contractor will make the applicable changes to comply with this specification, at the contractor's expense.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the site in containers with manufacturer's stamp or label affixed.
- B. Store and protect products against dirt, water, chemical, and mechanical damage. Do not install damaged components. Remove damaged products from project site.

## PART 2 - PRODUCTS

## 2.1 LOUVERS

- A. Louvers are generally to be provided under Division 10. Where louvers are not covered on architectural plans and specifications, contractor is to provide under the following specification:
  - 1. Louvers to be 1.5" deep, 35° drainable fixed blade design, constructed as specified on the plans.
  - 2. Provide with ½" x ½" galvanized mesh birdscreen mounted on backside of louver.
  - 3. Finish/color per architect/engineer's review.
  - 4. Manufacturer: American Warming, Industrial Louver, Vent Products, NCA, Swartout, Ruskin ELF6375DX Louvers & Dampers or equal.

## PART 3 - EXECUTION

## 3.1 ADJUSTING AND CLEANING

- A. Clean the inside of casings, enclosures and fans before starting fans.

END OF SECTION 233113

## PART 1 - GENERAL

## 1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, Section 230500 - Basic Materials and Methods, and other Sections in Division 23 specified herein.

## 1.2 SCOPE

- A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
  - 1. Unit heaters.

## 1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 230500: Basic Materials and Methods
- B. Section 230593: Testing, Adjusting and Balancing
- C. Section 233113: Air Distribution
- D. Division 26: Electrical

## 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide systems that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.
- B. Codes and Standards: Provide components and pumps conforming to the requirements of the latest addition of the following:
  - 1. American Society of Mechanical Engineers (ASME): Boiler and Pressure Vessel Code
    - a. Section VIII D1 Rules for Construction of Pressure Vessels including Addendums
    - b. Section VIII D2 Rules for Construction of Pressure Vessels including Addendums
    - c. Section IX Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators including Addendums
    - d. B31.1 Power Piping
  - 2. National Electrical Manufacturers Association (NEMA): Provide electrical components that comply with NEMA Standards.
  - 3. National Fire Protection Association (NFPA):
    - a. 70 National electrical Code

## 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for units showing dimensions, weights (shipping, installed, and operating), capacities, ratings, performance with operating point

clearly indicated, motor electrical characteristics, finishes of materials, and installation instructions.

- B. Maintenance Data: Submit maintenance instructions, including instructions for lubrication, tube replacement, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in operating and maintenance manuals.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units to the site in containers with manufacturer's stamp or label affixed.
- B. Store and protect units against dirt, water, chemical, and mechanical damage. Do not install damaged units - remove from project site.
- C. Rigging: Comply with the manufacturer's rigging and installation instructions.

#### 1.7 WARRANTY

- A. Provide general one-year (12 months) warranty. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

### PART 2 - PRODUCTS

#### 2.1 UNIT HEATERS (GAS FIRED)

- A. Provide gravity-vented, high-efficiency, gas-fired unit heaters. Reznor, Modine, or equal units. Units are designed to take combustion air from the indoor space and vent to the outdoors.
- B. Each shall be equipped for use with propane gas and 120/1 volt power supply. The heat exchanger shall be aluminized steel. Die-formed burners shall be of aluminized steel and include flared ports and a stainless steel insert. The units shall be designed to provide 80% thermal efficiency.
- C. Special features: Provide the following:
  1. 24-volt control transformer
  2. Provide single stage gas control system;
  3. Ignition: manual match-lit pilot;
  4. Fan and limit safety controls;
  5. Fan: centrifugal blower with adjustable belt drive; and an open, drip-proof (totally enclosed) blower motor with internal overloads. Each unit must be able to overcome .25" w.c. (5" w.c.) of external static pressure (and may be equipped with an OSHA-type belt and/or blower inlet guard).
  6. The cabinet is equipped with horizontal louvers for directing airflow.
  7. The unit is arranged for ceiling suspension with 4-point threaded hanger connections (hanger kits).
- D. Gas fired unit heaters are to be design ETL Listed for commercial/industrial installation.



## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. All equipment, unless otherwise shown or noted on the Drawings, is to be installed in accordance with industry standards and manufacturer's recommended installation instructions.
- B. Provide vibration isolation, inertia bases, seismic snubber, flexible pipe connections, etc, as specified in related specification sections.
- C. Flush and clean equipment, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls.
- D. Contractor to coordinate all electrical requirements with electrical contractor.

END OF SECTION 238239

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract Documents, including Division 1 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Electrical equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Common electrical installation requirements.

**1.03 DEFINITIONS**

- A. ATS: Acceptance Testing Specifications.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene rubber.

**1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated.

**1.05 QUALITY ASSURANCE**

- A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

**1.06 COORDINATION**

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.02 SLEEVES FOR RACEWAYS AND CABLES**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

**2.03 SLEEVE SEALS**

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 3. Pressure Plates: Plastic. Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

**PART 3 - EXECUTION****3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION**

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

**3.02 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS**

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
  - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require a different clearance.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- I. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

- J. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - K. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.
- 3.03 SLEEVE-SEAL INSTALLATION
- A. Install to seal underground, exterior wall penetrations.
  - B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.04 FIELD QUALITY CONTROL
- A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work.
- 3.05 ADHESIVES AND SEALANTS
- A. Use only low-emitting VOC adhesives and sealants per the LEED-NC Version 2.2 reference guide, credit EQ-4.1.

END OF SECTION

**PART 1 - GENERAL****1.01 PRINCIPAL WORK IN THIS SECTION**

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions and conditions at the jobsite.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

**1.02 SUBMITTALS**

- A. Refer to Section 013301 - Submittals.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Section 013301 and as herein specified.
- C. Submit Manufacturers data and shop drawings.
  - 1. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
  - 2. Field Test Reports: Submit written test reports to include the following:
    - a. Test procedures used.
    - b. Test results that comply with requirements.
    - c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

**1.03 REFERENCE STANDARDS**

- A. California Building Code current at time of permit issuance.
- B. Title 24 California Code of Regulations.
- C. ADA – Americans with Disabilities Act.

**1.04 QUALITY ASSURANCE**

- A. Refer to Section 014529 – Quality Control.
- B. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise on-site testing specified in Part 3.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 1. Comply with UL 467.

- D. Comply with CEC; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
  - E. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.
- 1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Comply with Section 016550 - Product Delivery, Storage and Handling.
- 1.06 JOB CONDITIONS
- A. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.
- 1.07 GUARANTEE / WARRANTY
- A. Refer to Division 0 – Bidding and Contract Requirements.
  - B. Refer to Section 017700 – Contract Closeout.
  - C. Refer to Section 017840 - Record Drawings.
- 1.08 OPERATION AND MAINTENANCE DATA
- A. Submit as part of project closeout:
  - B. Complete instructions regarding maintenance of the materials, finishes, etc.
  - C. Comply with Section 017700 Contract Closeout.

**PART 2 - PRODUCTS**

- 2.01 ACCEPTABLE MANUFACTURERS
- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
  - B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
    - 1. Grounding Conductors, Cables, Connectors, and Rods:
      - a. Copperweld Corp.
      - b. Erico Inc.; Electrical Products Group.
      - c. Framatome Connectors/Burndy Electrical.
      - d. Ideal Industries, Inc.
      - e. ILSCO.
      - f. Kearney/Cooper Power Systems.
      - g. O-Z/Gedney Co.; a business of the EGS Electrical Group.
      - h. Reviewed equivalent by Owner.
        - 1. Substitutions and deviations shall require Owner's approval and shall be given in letterform.
        - 2. Refer to Division 1, Section 012300 and Section 013301 – Alternates and Submittals.
        - 3. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
  - C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.

- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

## 2.02 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Material: copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.
- F. Concrete Encased Electrode: #4 bare copper, minimum 25 feet.
- G. Underground Conductors: Bare, tinned, solid, unless otherwise indicated.
- H. Bare Copper Conductors: Comply with the following:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
- I. Copper Bonding Conductors: As follows:
  - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
  - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
  - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

## 2.03 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

## 2.04 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
  - 1. Size: 5/8 inches in diameter by 96 inches in length.

- B. Test Wells: Provide handholes as specified in Division 2 Section "Underground Ducts and Utility Structures."

### PART 3 - EXECUTION

#### 3.01 INSPECTION / EXAMINATION

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

#### 3.02 COORDINATION

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

#### 3.03 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
  - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
- G. Underground Grounding Conductors: Use copper conductor, No. 2 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

#### 3.04 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with CEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by CEC are indicated.
- B. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by CEC:
  - 1. Feeders and branch circuits.
  - 2. Single-phase motor and appliance branch circuits.
  - 3. Three-phase motor and appliance branch circuits.



4. Flexible raceway runs.
- C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
  - D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
  - E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
  - F. Nonmetallic Raceways: Install an equipment grounding conductor in all nonmetallic raceways unless they are designated for telephone or data cables.
  - G. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
  - H. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
  - I. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
  - J. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

### 3.05 INSTALLATION

- A. Ground Rods: If supplemental grounding rods are required, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
  - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
  - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded

connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- F. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to CEC, Paragraph 250.81(c), using a minimum of 25 feet of bare copper conductor not smaller than No. 4 AWG. Bond grounding conductor to reinforcing steel in at least four locations.
- G. All metal pipes extending through slab to metallic enclosure shall have assured bonding per CEC.

### 3.06 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by

connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

### 3.07 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank. Minimum duct bank grounding conductor to be #2 copper.
- B. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

### 3.08 FIELD QUALITY CONTROL

- A. Testing: Contractor shall perform the following field quality-control testing:
  - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
  - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
  - 3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results.
    - a. Equipment Rated 500 kVA and Less: 10 ohms.
    - b. Manhole Grounds: 10 ohms.
  - 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify County promptly and include recommendations to reduce ground resistance.

### 3.09 PROTECTION AND CLEAN UP

- A. Keep areas of work free from debris as work progresses.
  - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
- B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

- C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
- D. After completion of work in this section, remove all erection equipment and implements of service, and debris.
  - 1. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION

**PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract Documents, including Division 1 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
  - 1. Division 26 Section "Raceways and boxes" for products and installation requirements necessary for compliance.

**1.03 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of 5 times the applied force.

**1.05 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
  - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Nonmetallic slotted channel systems. Include Product Data for components.
  - 4. Equipment supports.
- C. Welding certificates.

**1.06 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

**PART 2 - PRODUCTS****2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.

- c. ERICO International Corporation.
- d. GS Metals Corp.
- e. Thomas & Betts Corporation.
- f. Unistrut; Tyco International, Ltd.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. Fabco Plastics Wholesale Limited.
    - d. Seasafe, Inc.
  3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
  4. Fitting and Accessory Materials: Same as channels and angles.
  5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti Inc.
      - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
  2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cooper B-Line, Inc.; a division of Cooper Industries.

- 2) Empire Tool and Manufacturing Co., Inc.
- 3) Hilti Inc.
- 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

## 2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

## PART 3 - EXECUTION

### 3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  1. To Wood: Fasten with lag screws or through bolts.
  2. To New Concrete: Bolt to concrete inserts.
  3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  4. To Existing Concrete: Expansion anchor fasteners.
  5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
  6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
  7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
  - D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- 3.03 INSTALLATION OF FABRICATED METAL SUPPORTS
- A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.
  - B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
  - C. Field Welding: Comply with AWS D1.1/D1.1M.
- 3.04 CONCRETE BASES
- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
  - B. Use 2500 psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."
  - C. Anchor equipment to concrete base.
    1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    2. Install anchor bolts to elevations required for proper attachment to supported equipment.
    3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
- 3.05 PAINTING
- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
  - B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
  - C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION



## PART 1 - GENERAL

## 1.01 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.
  - 2. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

## 1.02 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. RMC, RSC, RMC: Rigid Metallic Conduit, Rigid Steel, Rigid Metallic Conduit.
- C. ENT: Electrical nonmetallic tubing.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. RNC: Rigid nonmetallic conduit.

## 1.03 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
  - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- E. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

## 1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

## 1.05 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

## 2.02 METAL CONDUIT AND TUBING

- A. Available Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflex Inc.
  - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 4. Electri-Flex Co.
  - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
  - 6. O-Z Gedney; Unit of General Signal.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- E. Plastic-Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C80.3.
  - 1. Fittings: Steel, compression type.
- G. FMC: Zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

## 2.03 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers:
  - 1. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 2. Cantex Inc.
  - 3. Condux International.
  - 4. Electri-Flex Co.
  - 5. Lamson & Sessions; Carlon Electrical Products.
  - 6. RACO; Division of Hubbell, Inc.
  - 7. Spiralduct, Inc./AFC Cable Systems, Inc.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

## 2.04 METAL WIREWAYS

- A. Available Manufacturers:
  - 1. Square D.
  - 2. Hoffman.
  - 3. Wiremold Company (The); Electrical Sales Division
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with CEC.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

#### 2.05 NONMETALLIC WIREWAYS

- A. Available Manufacturers:
  - 1. Hoffman.
  - 2. Lamson & Sessions; Carlon Electrical Products.
  - 3. Wiremold Company (The); Electrical Sales Division
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with CEC.

#### 2.06 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and paint to match adjacent surface.
  - 1. Available Manufacturers:
    - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
    - b. Thomas & Betts Corporation.
    - c. Walker Systems, Inc.; Wiremold Company (The).
    - d. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
  - 1. Available Manufacturers:
    - a. Butler Manufacturing Co.; Walker Division.
    - b. Hubbell, Inc.; Wiring Device Division.
    - c. Lamson & Sessions; Carlon Electrical Products.
    - d. Panduit Corp.
    - e. Walker Systems, Inc.; Wiremold Company (The).
    - f. Wiremold Company (The); Electrical Sales Division.
- C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

#### 2.07 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
  - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  - 2. Emerson/General Signal; Appleton Electric Company.
  - 3. Erickson Electrical Equipment Co.
  - 4. Hoffman.
  - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
  - 6. O-Z/Gedney; Unit of General Signal.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Floor Boxes: Nonmetallic, nonadjustable, round.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

## 2.08 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION

- A. Outdoors:
  1. Exposed: Rigid steel or IMC.
  2. Concealed: Rigid steel or IMC.
  3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC.
  5. Underground: Schedule 40 PVC.
  6. Stub-ups from below grade to above grade: Schedule 80 PVC
  7. Pull boxes: PVC 40 terminated with endbells
  8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  9. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
  1. Exposed: RMC or EMT.
  2. Concealed: EMT.
  3. Stub-ups through concrete floor or slab: double wrapped rigid steel or PVC coated rigid steel.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  5. Damp or Wet Locations: Rigid steel conduit.
  6. Indoor Exposed or Damp Wet Locations: RMC.
  7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.
- C. Minimum Raceway Size: 3/4-inch trade size, except 1" for outdoor RNC underground.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits embedded in or in contact with concrete.

### 3.02 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods." Conduit shall be supported with two hole straps and shall be anchored as follows:
  1. Wood using lag bolts or screws
  2. Concrete using insert or expansion bolt
  3. Brick using expansion bolt
  4. Hollow masonry using toggle bolts.

- D. Straps shall be steel. Expanders and shields shall be steel.
- E. Install temporary closures to prevent foreign matter from entering raceways.
- F. All pull boxes shall be installed in accessible spaces. Do not install in finished areas unless approved by the county.
- G. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- H. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated. Provide no more than 270 degrees total bends between boxes or cabinets.
- I. Conduits shall terminate at a box or cabinet with a compression connector with insulated throat and insulated bushing for EMT. Provide plastic bell ends for PVC conduit.
- J. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
  - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- K. Conduits 1-1/2" and larger are to be installed in subgrade. Conduits 1-1/4" and smaller may be installed on subgrade, no more than one conduit high. Conduit crossing to occur below subgrade. Secure all conduits to prevent "floating" during concrete pour.
- L. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 4. Change from nonmetallic tubing or conduit to rigid steel conduit, or IMC before rising above the floor.
- M. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- N. Conduit installed above an acoustical ceiling shall be at least 12 inches above the grid.
- O. Install all utility conduits as per requirements from that utility. Coordinate installation of utility conduits with utility representative.
- P. Join raceways with fittings designed and approved for that purpose and make joints tight.
  - 1. Use insulating bushings to protect conductors.
- Q. Tighten compression type fittings with suitable tools.
- R. Terminations:
  - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
  - 3. All conduits metal connected to panels and switchboards shall have a ground lug bushing connected to the equipment ground bus.
- S. Underground conduits to be a minimum of 24" below final grade to top of topmost conduit. Provide minimum 3" sand bedding at bottom of trench. Maintain separation of conduits per trench detail. Minimum size of underground conduit, outside of foundation, to be 1 inch. Minimum size within foundation to be 3/4 inch.
- T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- U. Telephone and Signal System Raceways: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

- V. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where otherwise required by CEC.
- W. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; PVC wrapped FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections. Grout or seal to provide a watertight penetration. RSC through slab shall be wrapped with PVC tape or PVC coated RSC.
- X. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- Y. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- Z. Set floor boxes level and flush with finished floor surface.
- AA. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- BB. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

**3.03 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

**3.04 CLEANING**

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

**PART 1 - GENERAL****1.01 PRINCIPAL WORK IN THIS SECTION**

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions at the jobsite.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

**1.02 REFERENCE STANDARDS**

- A. California Building Code current at time of permit issuance
- B. Title 24 California Code of Regulations
- C. ADA – Americans with Disabilities Act
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**1.03 SUBMITTALS**

- A. Refer to Section 013301 – Submittals.
- B. Submit Manufacturer's data and shop drawings.
  - 1. Product Data: For each type of product indicated.
  - 2. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

**1.04 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

**1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Comply with Section 016550 - Delivery, Storage and Handling.

**1.06 JOB CONDITIONS**

- A. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

**1.07 OPERATION AND MAINTENANCE DATA**

- A. Submit as part of project closeout:
  - 1. Complete instructions regarding maintenance of the materials, finishes, etc.

**1.08 RELATED WORK / SECTIONS**

- A. Related Sections include, but are not limited to the following:
  - 1. Section 260533 "Raceways and Boxes" for conduit, tray, and box requirements.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE MANUFACTURERS**

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
  - 1. Refer to documents and as herein specified.
  - 2. Reviewed equivalent by Owner.
    - a. Substitutions and deviations shall require Owner's approval and shall be given in letterform.

- b. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

**2.02 CONDUCTORS AND CABLES**

- A. Available Manufacturers:
  - 1. American Insulated Wire Corp.; a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Senator Wire & Cable Company.
  - 4. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5, not less than 98% conductivity. Solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN or XHHW complying with NEMA WC 5.
- E. Conductors shall be UL labeled, be color coded and be marked with gauge, type and manufacturer's name on 24" on center. Where stranded wire is used, solid pigtail shall be used for connection to screw terminals of receptacles, switches, etc.

**2.03 CONNECTORS AND SPLICES**

- A. Available Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. AMP Incorporated/Tyco International.
  - 3. Hubbell/Anderson.
  - 4. O-Z/Gedney; EGS Electrical Group LLC.
  - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**PART 3 - EXECUTION**

**3.01 INSPECTION / EXAMINATION**

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

**3.02 COORDINATION**

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

**3.03 CONDUCTOR AND INSULATION APPLICATIONS**

- A. Service Entrance: Type XHHW, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.



- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- J. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable in raceway.
- K. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- L. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

**3.04 INSTALLATION**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Minimum wire size for power and lighting circuits shall be #12 AWG unless otherwise noted. Increase homeruns to #10 for 20 ampere, 120/208 volt circuits longer than 75 feet and for 20 ampere 277/480 circuits longer than 200 feet.
- F. When conductors are increased for voltage drop considerations, the conductors shall terminate in one of the following means:
  - 1. Provide larger breaker frame or panel
  - 2. Provide oversized lugs
  - 3. Splice pigtail at panel or box, only with approval of County.
- G. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- H. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- I. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

**3.05 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

**3.06 FIELD QUALITY CONTROL**

- A. Cable shall be delivered to the jobsite in original unbroken packages and shall be approved for use by the inspector prior to installation.
- B. Testing: Perform the following field quality-control testing:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**3.07 PROTECTION AND CLEAN UP**

- A. Keep areas of work free from debris as work progresses.
  - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
- B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
- D. After completion of work in this section, remove all erection equipment and implements of service, and debris.
  - 1. Leave entire area in a neat, clean, acceptable condition.
- E. Provide record drawings in accordance with Section 01700 - Record Documents and Project Closeout.
- F. Provide Guarantee / Warranties and Bonds as required in this specification section and as listed in Section 01700 - Record Documents and Project Closeout.

END OF SECTION

**PART 1 - GENERAL****1.01 PRINCIPAL WORK IN THIS SECTION**

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions at the jobsite.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes electrical identification materials and devices required to comply with ANSI C2, CEC, OSHA standards, and authorities having jurisdiction.

**1.02 REFERENCE STANDARDS**

- A. California Building Code current at time of permit issuance.
- B. Title 24 California Code of Regulations.
- C. ADA – Americans with Disabilities Act.

**1.03 SUBMITTALS**

- A. Refer to Section 013301 - Submittals
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Section 01700 and as herein specified.
- C. Submit Manufacturers data and shop drawings for each electrical identification product indicated.

**1.04 QUALITY ASSURANCE**

- A. Comply with ANSI C2.
- B. Comply with CEC.

**1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Comply with Section 016550 - Product Delivery, Storage and Handling.

**1.06 JOB CONDITIONS**

- A. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

**1.07 OPERATION AND MAINTENANCE DATA**

- A. Submit as part of project closeout:
- B. Complete instructions regarding maintenance of the materials, finishes, etc.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE MANUFACTURERS**

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
  - 1. Refer to documents and as herein specified.
  - 2. Reviewed equivalent by Owner.
    - a. Substitutions and deviations shall require Owner's approval and shall be given in letterform.
    - b. Refer to Division 1, Section 013301– Submittals.
    - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

**2.02 RACEWAY AND CABLE LABELS**

- A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.
- B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.
- C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.
- D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
  1. Not less than 6 inches wide by 4 mils thick.
  2. Compounded for permanent direct-burial service.
  3. Embedded continuous metallic strip or core.
  4. Printed legend indicating type of underground line.
- F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.
- I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.
- J. Brass or Aluminum Tags: 2 by 2 by 0.05-inch metal tags with stamped legend, punched for fastener.

#### 2.03 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
  1. Engraved legend with black letters on white face.
  2. Punched or drilled for mechanical fasteners.
- C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
- D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
- E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

#### 2.04 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
  1. Minimum Width: 3/16 inch.
  2. Tensile Strength: 50 lb minimum.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
  1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
  2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
  3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
  4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

**PART 3 - EXECUTION****3.01 INSPECTION / EXAMINATION**

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

**3.02 COORDINATION**

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

**3.03 INSTALLATION**

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.
- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before applying.
- E. Install painted identification according to manufacturer's written instructions and as follows:
  - 1. Clean surfaces of dust, loose material, and oily films before painting.
  - 2. Prime surfaces using type of primer specified for surface.
  - 3. Apply one intermediate and one finish coat of enamel.
- F. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:
  - 1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  - 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
  - 3. Apply the following colors to the systems listed below:
    - a. Fire Alarm System: Red
    - b. Security System: Blue and yellow
    - c. Mechanical and Electrical Supervisory System: Green and blue
    - d. Telecommunication System: Green and yellow
- G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.
- H. Circuit Identification Labels on Boxes: Install labels externally.
  - 1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
  - 2. Concealed Boxes: Plasticized card-stock tags.
  - 3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- I. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker.
- J. Color-Coding of Secondary Phase Conductors: Use the following colors for feeder and branch-circuit phase conductors:
  - 1. 208/120-V Conductors:
    - a. Phase A: Black.
    - b. Phase B: Red.

- c. Phase C: Blue.
  - 2. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  - 3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
    - a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch- wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
  - K. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
    - 1. Legend: 1/4-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
    - 2. Tag Fasteners: Nylon cable ties.
    - 3. Band Fasteners: Integral ears.
  - L. Apply identification to conductors as follows:
    - 1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
    - 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
    - 3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.
  - M. Apply warning, caution, and instruction signs as follows:
    - 1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
  - N. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
    - 1. Panelboards, electrical cabinets, and enclosures.
    - 2. Access doors and panels for concealed electrical items.
    - 3. Electrical switchgear and switchboards.
    - 4. Disconnect switches.
    - 5. Enclosed circuit breakers.
    - 6. Motor starters.
    - 7. Push-button stations.
    - 8. Contactors.
    - 9. Dimmers.
    - 10. Control devices.
    - 11. Telephone switching equipment.
    - 12. Fire alarm master station or control panel.
- 3.04 PROTECTION AND CLEAN UP
- A. Keep areas of work free from debris as work progresses.
    - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
  - B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

- C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
- D. After completion of work in this section, remove all erection equipment and implements of service, and debris.
  - 1. Leave entire area in a neat, clean, acceptable condition.
- E. Provide record drawings in accordance with Section 01700 - Record Documents and Project Closeout.
- F. Provide Guarantee / Warranties and Bonds as required in this specification section and as listed in Section 017700 – Contract Closeout.

END OF SECTION

**PART 1 - GENERAL**

**1.01 PRINCIPAL WORK IN THIS SECTION**

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions and conditions at the jobsite.
- C. Provide materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
  - 1. Appliance branch-circuit panelboards.
  - 2. Distribution panelboards.
  - 3. (TVSS)Transient voltage surge suppressor panelboards.
  - 4. Overcurrent Protective Devices
  - 5. Accessory Components and Features.

**1.02 REFERENCE STANDARDS**

- A. California Building Code current at time of permit issuance
- B. Title 24 California Code of Regulations (CEC)
- C. ADA – Americans with Disabilities Act
- D. CBC Energy Code

**1.03 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.
- F. TVSS: Transient voltage surge suppressor.

**1.04 SUBMITTALS**

- A. Refer to Section 013301 – Submittals.
- B. Submit Manufacturer’s data and shop drawings.
  - 1. Product Data:
    - a. For each type of component herein listed in addition to those indicated in documents.
      - 1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
    - b. Installation Manuals
    - c. Warranties
  - 2. Shop Drawings:
    - a. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      - 1. Enclosure types and details for types other than NEMA 250, Type 1.
      - 2. Bus configuration, current, and voltage ratings.
      - 3. Short-circuit current rating of panelboards and overcurrent protective devices.
      - 4. UL listing for series rating of installed devices.
      - 5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
    - b. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
  - 1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. The term "withstand" means "the unit will remain in place without separation of internal and external parts during a seismic event."



- 3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- 4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- E. Field Test Reports: Submit written test reports and include the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- G. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

**1.05 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA PB 1.
- D. Comply with CEC.

**1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Comply with Section 01630 - Product Delivery, Storage and Handling.

**1.07 JOB CONDITIONS**

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

**1.08 GUARANTEE / WARRANTY**

- A. Refer to Section 017700 Project Closeout.

**1.09 OPERATION AND MAINTENANCE DATA**

- A. Submit as part of project closeout:
  - 1. Complete instructions regarding operation of the equipment.
  - 2. Complete instructions regarding maintenance of the materials, finishes, etc.
  - 3. Comply with Section 017700 - Project Closeout.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURER**

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
  - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. Square D Co.
    - b. Eaton Corp.; Cutler-Hammer Products.
    - c. General Electric Co.; Electrical Distribution & Control Div.
    - d. Siemens Energy & Automation, Inc.

- 2. TVSS Panelboards:
  - a. Current Technology, Inc.
  - b. Liebert Corporation.
- 3. Reviewed equivalent by Owner.
  - a. Substitutions and deviations shall require Owner's approval and shall be given in letterform.
  - b. Refer to Division 1, Section 013301 – Submittals.
  - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

**2.02 MATERIALS**

**A. General**

- 1. Panelboard Short Circuit Rating
  - a. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.
  - b. Fully rated to interrupt symmetrical short-circuit current available at terminals.
- 2. Panelboard Arc Flash Hazard Rating
  - a. Provide field marking to warn persons of potential electric arc flash hazards.
  - b. The marking shall be so located so as to be clearly visible to qualified persons before examination, adjustment or servicing of the equipment.

**B. Product Schedule:**

**1. Appliance Branch-Circuit Panelboards**

- a. Description:
  - 1. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
  - 2. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

**2. Distribution Panelboards**

- a. Description
  - 1. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
  - 2. Main Overcurrent Protective Devices: Circuit breaker.
  - 3. Branch overcurrent protective devices shall be one of the following:
    - a. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
    - b. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
    - c. Fused switches.

**3. TVSS Panelboards**

- a. Description
  - 1. Doors: Front mounted; secured with vault-type latch with tumbler lock; keyed alike. Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
  - 2. Main Overcurrent Devices: Thermal-magnetic circuit breaker.
  - 3. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.
  - 4. Bus: Copper phase and neutral buses; 200 percent capacity neutral bus.
  - 5. TVSS Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.
    - a. Minimum single-impulse current rating shall be as follows:
    - b. Line to Neutral: 100,000 A.
    - c. Line to Ground: 100,000 A.
    - d. Neutral to Ground: 50,000 A.
    - e. Protection modes shall be as follows:

- f. Line to neutral.
  - g. Line to ground.
  - h. Neutral to ground.
  - i. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.
  - j. Accessories shall include the following:
  - k. Form-C contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.
  - l. Audible alarm activated on failure of any surge diversion module.
  - m. Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.
4. Overcurrent Protective Devices
- a. Description
    - 1. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
      - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
      - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
      - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    - 2. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
5. Accessory Components And Features
- a. Description:
    - 1. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
    - 2. Portable Test Set: To test functions of solid-state trip devices without removal from panelboard.

**PART 3 - EXECUTION**

**3.01 INSPECTION / EXAMINATION**

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

**3.02 COORDINATION**

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- B. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.
- C. Keys: Six spares of each type of panelboard cabinet lock.

**3.03 FABRICATION AND FEATURES**

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
  - 1. Outdoor Locations: NEMA 250, Type 3R.
  - 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  - 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door. Final loads to be typewritten on directory cards per markup record drawings.
- F. Bus: Hard-drawn copper, 98 percent conductivity.
- G. Main and Neutral Lugs: Compression type suitable for use with conductor material.
- H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- J. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- K. Isolated Equipment Ground Bus: Where shown on drawings, adequate for branch-circuit equipment ground conductors, insulated from box.
- L. Extra-Capacity Neutral Bus: All receptacle panels shall have neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads. Receptacle panels are all panels serving open office areas or raised access floor areas with whip connections to furniture partitions.
- M. Split Bus: Where shown, vertical buses divided into individual vertical sections.
- N. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- O. Gutter Barrier: Arrange to isolate individual panel sections.
- P. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses. See drawings for locations.
- Q. Feed-through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

**3.04 INSTALLATION**

- A. Install panelboards and accessories according to NEMA PB 1.1 and Manufacturer's recommendations.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."
- C. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- F. Install filler plates in unused spaces.
- G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

**3.05 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

**3.06 CONNECTIONS**

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

**3.07 FIELD QUALITY CONTROL**

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
  - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
  - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 3. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

**3.08 ADJUSTING**

- A. Set field-adjustable switches and circuit-breaker trip ranges.
- B. Program all systems integral with key pads.

**3.09 PROTECTION AND CLEAN UP**

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.
- B. Keep areas of work free from debris as work progresses.
  - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
- E. After completion of work in this section, remove all erection equipment and implements of service, and debris.
  - 1. Leave entire area in a neat, clean, acceptable condition.
- F. Provide record drawings in accordance with Section 017840 – Record Drawings.

- G. Provide Guarantee / Warranties and Bonds as required in this specification section and as listed in Section 01700 - Record Documents and Project Closeout.

END OF SECTION

**PART 1 - GENERAL****1.01 PRINCIPAL WORK IN THIS SECTION**

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions and conditions at the jobsite.
- C. Provide materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes the following:
  - 1. Adjust list below to suit Project.
  - 2. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
  - 3. Single- and double-pole snap switches and dimmer switches.
  - 4. Device wall plates.
  - 5. Pin and sleeve connectors and receptacles.
  - 6. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

**1.02 REFERENCE STANDARDS**

- A. California Building Code current at time of permit issuance
- B. Title 24 California Code of Regulations
- C. ADA – Americans with Disabilities Act

**1.03 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.
- G. EV: Electric Vehicle

**1.04 SUBMITTALS**

- A. Refer to Section 013001 – Submittals.
- B. Submit O & M (operation and Maintenance) manuals in accordance with Section 01700 and as herein specified.
- C. Submit Manufacturer's data and shop drawings.
  - 1. Product Data: For each type of product indicated.
  - 2. Shop Drawings:
    - a. List of legends and description of materials and process used for premarking wall plates.
    - b. Electric vehicle charging station equipment and mounting.
- D. Samples: One for each type of device and wall plate specified, in each color specified.
- E. Field quality-control test reports.

**1.05 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with CEC.

**1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Comply with Section 016550 - Delivery, Storage and Handling.

**1.07 JOB CONDITIONS**

- A. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

**1.08 GUARANTEE / WARRANTY**

- A. Refer to Division 0 – Bid and Contract Requirements.

**1.09 OPERATION AND MAINTENANCE DATA**

- A. Submit as part of project closeout:
  - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
  - 2. Comply with Section 017700 - Contract Closeout.

**1.10 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Service Outlet Assemblies: One for every 10, but no fewer than two.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE MANUFACTURER**

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
  - 1. Wiring Devices:
    - a. Bryant Electric, Inc./Hubbell Subsidiary.
    - b. Eagle Electric Manufacturing Co., Inc.
    - c. Hubbell Incorporated; Wiring Device-Kellems.
    - d. Leviton Mfg. Company Inc.
    - e. Pass & Seymour/Legrand; Wiring Devices Div.
    - f. Lutron
  - 2. Wiring Devices for Hazardous (Classified) Locations:
    - a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
    - b. EGS/Appleton Electric Company.
    - c. Killark Electric Manufacturing Co./Hubbell Incorporated.
    - d. Multioutlet Assemblies:
    - e. Hubbell Incorporated; Wiring Device-Kellems.
    - f. Wiremold Company (The).
  - 3. Reviewed equivalent by Owner.
    - a. Substitutions and deviations shall require Owner's approval and shall be given in letterform.
    - b. Refer to Division 1, Section 013301 – Submittals.
    - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

**2.02 RECEPTACLES**

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
  - 1. Decora style
  - 2. Color as selected by Owner
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. GFCI Receptacles: Straight blade, feed -through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.



- D. Isolated-Ground Receptacles: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.
    - 1. Devices: Listed and labeled as isolated-ground receptacles.
    - 2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.
  - E. TVSS Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.
    - 1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.
    - 2. Active TVSS Indication: Visual only with light visible in face of device to indicate device is "active" or "no longer in service."
    - 3. Receptacle Type: Heavy-Duty grade, with isolated-ground terminal.
    - 4. Identification: Distinctive marking on face of device to denote TVSS-type unit.
  - F. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.
  - G. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.
- 2.03 PENDANT CORD/CONNECTOR DEVICES
- A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
    - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
    - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.
- 2.04 CORD AND PLUG SETS
- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
    - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
    - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.
- 2.05 SWITCHES
- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
    - 1. Decora style
    - 2. Color as selected by Owner
  - B. Snap Switches: Heavy -Duty grade, quiet type.
  - C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
    - 1. Switch: 20 A, 120/277-V ac.
    - 2. Receptacle: NEMA WD 6, Configuration 5-15R.
  - D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
    - 1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
    - 2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.
    - 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

**2.06 WALL PLATES**

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic
    - a. Color as selected by Owner
    - b. Style: Decora
  - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic, white.
  - 4. Material for Wet Locations: Grey thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

**2.07 FLOOR SERVICE FITTINGS**

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Round, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

**2.08 MULTIOUTLET ASSEMBLIES**

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: Metal, with manufacturer's standard finish.
- C. Wire: No. 12 AWG.

**2.09 FINISHES**

- A. Color:
  - 1. Wiring Devices Connected to Normal Power System:
    - a. Color as selected by Owner, unless otherwise indicated or required by CEC.
  - 2. Wiring Devices connected to Standby System:
    - a. Orange, with white faceplate as selected by Architect or to match adjacent surface.
  - 3. TVSS Devices:
    - a. Blue with white faceplate or as selected by Architect.
  - 4. Isolated-Ground Receptacles:
    - a. As specified above, with orange triangle on face.

**PART 3 - EXECUTION****3.01 INSPECTION / EXAMINATION**

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

**3.02 COORDINATION**

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- B. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

**3.03 INSTALLATION**

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Provide GFCI receptacle as each location identified, through wiring is not acceptable.
- C. Provide weatherproof "while-in-use" covers where required. Each receptacle or device shall have a separate lid.
- D. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

- E. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.
  - F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
  - G. Remove wall plates and protect devices and assemblies during painting.
  - H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
  - I. Provide all receptacles shown on the Architectural casework or elevations. Circuit to nearest 120 vac "house" circuit.
- 3.04 IDENTIFICATION
- A. Comply with Division 16 Section "Electrical Identification."
    - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.05 CONNECTIONS
- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
  - B. Connect wiring according to Division 26 Section "Conductors and Cables."
  - C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- 3.06 FIELD QUALITY CONTROL
- A. Perform the following field tests and inspections and prepare test reports:
    - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
    - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
  - B. Remove malfunctioning units, replace with new units, and retest as specified above.
- 3.07 PROTECTION AND CLEAN UP
- A. Keep areas of work free from debris as work progresses.
    - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
  - B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
  - C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
  - D. After completion of work in this section, remove all erection equipment and implements of service, and debris.
    - 1. Leave entire area in a neat, clean, acceptable condition.
  - E. Provide record drawings in accordance with Section 017700 - Contract Closeout.

END OF SECTION

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. This Section includes cartridge fuses, rated 600 V and less, for use in switches, panelboards, switchboards, controllers, and motor-control centers; and spare fuse cabinets.

## 1.02 SUBMITTALS

- A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings for each fuse type indicated.
- B. Product Data: Include the following for each fuse type indicated:
  - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 2. Let-through current curves for fuses with current-limiting characteristics.
  - 3. Time-current curves, coordination charts and tables, and related data.
  - 4. Fuse size for elevator feeders and elevator disconnect switches.
- C. Ambient Temperature Adjustment Information. If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses adjusted.
  - 1. For each adjusted fuse, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
  - 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

## 1.03 QUALITY ASSURANCE

- A. Source Limitations: Provide fuses from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA FU 1.
- D. Comply with CEC.

## 1.04 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

## 1.05 COORDINATION

- A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

## 1.06 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged in original cartons or containers and identified with labels describing contents.
  - 1. Fuses: Quantity equal to 5 percent of each fuse type and size, but not fewer than 2 of each type and size.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cooper Industries, Inc.; Bussmann Div.
  - 2. Eagle Electric Mfg. Co., Inc.
  - 3. Ferraz Corp.
  - 4. General Electric Co.; Wiring Devices Div.
  - 5. Gould Shawmut.
  - 6. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

**2.02 CARTRIDGE FUSES**

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

**2.03 SPARE FUSE CABINET**

- A. Cabinet: Wall-mounted, 0.05-inch- thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
  - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
  - 2. Finish: Gray, baked enamel.
  - 3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
  - 4. Fuse Pullers: For each size fuse.

**PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 FUSE APPLICATIONS**

- A. Main Service: Class RK1, fast acting.
- B. Main Feeders: Class RK1, fast acting.
- C. Motor Branch Circuits: Class RK1, time delay.
- D. Other Branch Circuits: Class RK1, time delay.

**3.03 INSTALLATION**

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare fuse cabinets.

**3.04 IDENTIFICATION**

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

**PART 1 - GENERAL****1.01 PRINCIPAL WORK IN THIS SECTION**

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions and conditions at the jobsite.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
  - 1. Service disconnecting means.
  - 2. Feeder and branch-circuit protection.
  - 3. Motor and equipment disconnecting means.

**1.02 REFERENCE STANDARDS**

- A. California Building Code current at time of permit issuance
- B. Title 24 California Code of Regulations
- C. ADA – Americans with Disabilities Act

**1.03 DEFINITIONS**

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

**1.04 SUBMITTALS**

- A. Refer to Section 013301 – Submittals.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Section 013301 and as herein specified.
- C. Submit Manufacturer's data and shop drawings.
  - 1. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - 2. Shop Drawings: For each switch and circuit breaker.
    - a. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      - 1. Enclosure types and details for types other than NEMA 250, Type 1.
      - 2. Current and voltage ratings.
      - 3. Short-circuit current rating.
      - 4. UL listing for series rating of installed devices.
      - 5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
    - b. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- D. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
  - 1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- E. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
  - F. Field Test Reports: Submit written test reports and include the following:
    - 1. Test procedures used.
    - 2. Test results that comply with requirements.
    - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
  - G. Manufacturer's field service report.
  - H. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:
    - 1. Routine maintenance requirements for components.
    - 2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
    - 3. Time-current curves, including selectable ranges for each type of circuit breaker.
- 1.05 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
    - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
  - B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - C. Comply with NEMA AB 1 and NEMA KS 1.
  - D. Comply with CEC.
  - E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Comply with Section 016550 - Product Delivery, Storage and Handling.
- 1.07 JOB CONDITIONS
- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
  - B. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - C. Altitude: Not exceeding 1,000 feet.
- 1.08 GUARANTEE / WARRANTY
- A. Refer to Section 017700 - Contract Closeout.
- 1.09 RELATED WORK / SECTIONS
- A. Related Sections include but are not limited to the following:
    - 1. Section 262726 - Wiring Devices, for attachment plugs, receptacles, and toggle switches used for disconnecting means.
- 1.10 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - B. Spares: For the following:
  - C. Potential Transformer Fuses: 2
  - D. Control-Power Fuses: 2
  - E. Fuses and Fusible Devices for Fused Circuit Breakers: 2

- F. Fuses for Fused Switches: 2
- G. Fuses for Fused Power-Circuit Devices: 2
- H. Spare Indicating Lights: 6 of each type installed.

**1.11 OPERATION AND MAINTENANCE DATA**

- A. Submit as part of project closeout:
  - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
  - 2. Comply with Section 017700 - Project Closeout.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE MANUFACTURERS**

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
  - 1. Fusible Switches:
    - a. Square D Co.
    - b. Eaton Corp.; Cutler-Hammer Products.
    - c. General Electric Co.; Electrical Distribution & Control Division.
    - d. Siemens Energy & Automation, Inc.
  - 2. Molded-Case Circuit Breakers:
    - a. Square D Co.
    - b. Eaton Corp.; Cutler-Hammer Products.
    - c. General Electric Co.; Electrical Distribution & Control Division.
    - d. Klockner-Moeller.
    - e. Siemens Energy & Automation, Inc.
  - 3. Combination Circuit Breaker and Ground-Fault Trip:
    - a. Square D Co.
    - b. Eaton Corp.; Cutler-Hammer Products.
    - c. General Electric Co.; Electrical Distribution & Control Division.
    - d. Siemens Energy & Automation, Inc.
  - 4. Molded-Case, Current-Limiting Circuit Breakers:
    - a. Square D Co.
    - b. Eaton Corp.; Cutler-Hammer Products.
    - c. General Electric Co.; Electrical Distribution & Control Division.
    - d. Siemens Energy & Automation, Inc.
  - 5. Integrally Fused, Molded-Case Circuit Breakers:
    - a. Square D Co.
    - b. Eaton Corp.; Cutler-Hammer Products.
    - c. General Electric Co.; Electrical Distribution & Control Division.
    - d. Siemens Energy & Automation, Inc.
  - 6. Reviewed equivalent by Owner.
    - a. Substitutions and deviations shall require Owner's approval and shall be given in letterform.
    - b. Refer to Division 1, Section 013301 – Submittals
    - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

**2.02 ENCLOSED SWITCHES**

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.



**2.03 ENCLOSED CIRCUIT BREAKERS**

- A. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
  - 1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
  - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  - 3. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

**2.04 ENCLOSURES**

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
  - 1. Outdoor Locations: NEMA 250, Type 3R.
  - 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  - 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

**2.05 FACTORY FINISHES**

- A. Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosures before shipping.

**PART 3 - EXECUTION****3.01 INSPECTION / EXAMINATION**

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.
- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 COORDINATION**

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- B. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels. Verify switching locations and fusing size with equipment manufacture.

**3.03 INSTALLATION**

- A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

**3.04 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

## 3.05 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

## 3.06 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
- B. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
- C. Test continuity of each line- and load-side circuit.
- D. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
- E. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
- F. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
- H. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
- I. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- J. Record of Infrared Scanning: Prepare a certified report that identifies switches and circuit breakers checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

## 3.07 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

## 3.08 PROTECTION AND CLEAN UP

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.
- B. Keep areas of work free from debris as work progresses.
  - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
- E. After completion of work in this section, remove all erection equipment and implements of service, and debris.
  - 1. Leave entire area in a neat, clean, acceptable condition.
- F. Provide record drawings in accordance with Section 017840 – Record Drawings
- G. Provide Guarantee / Warranties and Bonds as required in this specification section and as listed in Section 01700 - Record Documents and Project Closeout.

END OF SECTION

## PART 1 - GENERAL

## 1.01 PRINCIPAL WORK IN THIS SECTION

- A. Coordinate the work in this Section with related trades.
- B. Verify applicable dimensions at the jobsite.
- C. Provide materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
- D. This Section includes the following:
  - 1. Interior lighting fixtures with lamps and ballasts.
  - 2. Lighting fixtures mounted on exterior building surfaces.
  - 3. Emergency lighting units.
  - 4. Exit signs.
- E. Accessories, including fluorescent fixture dimmers occupancy sensors and lighting fixture retrofitting.

## 1.02 REFERENCE STANDARDS

- A. California Building Code current at time of permit issuance
- B. Title 24 California Code of Regulations
- C. ADA – Americans with Disabilities Act

## 1.03 DEFINITIONS

- A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.
- B. CRI: Color rendering index.
- C. CU: Coefficient of utilization.
- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
  - 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- E. RCR: Room cavity ratio.

## 1.04 SUBMITTALS

- A. Refer to Section 013101 – Submittals.
- B. Submit O & M (operation and Maintenance) manuals in accordance with Section 013101 and as herein specified.
- C. Submit Manufacturer's data and shop drawings.
  - 1. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
    - a. Physical description of fixture, including dimensions and verification of indicated parameters.
    - b. Emergency lighting unit battery and charger.
    - c. Fluorescent and high-intensity-discharge ballasts.
    - d. Air and Thermal Performance Data: For air-handling fixtures. Furnish data required in "Submittals" Article in Division 23 Section "Diffusers, Registers, and Grilles."
    - e. Sound Performance Data: For air-handling fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 23 Section "Diffusers, Registers and Grilles."
    - f. Lamps.
  - 2. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
  - 3. Wiring Diagrams: Power, signal, and control wiring.

- D. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which lighting-fixture suspension systems will be attached.
  - 3. Other items in finished ceiling, including the following:
    - a. Air outlets and inlets.
    - b. Speakers.
    - c. Sprinklers.
    - d. Access panels.
  - 4. Perimeter moldings.
- E. Samples for Verification: For interior lighting fixtures designated for sample submission in the Interior Lighting Fixture Schedule.
  - 1. Lamps: Specified units installed.
  - 2. Ballast: 120-V models of specified ballast types.
  - 3. Accessories: Cords and plugs.
- F. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.
- G. Source quality-control test reports.
- H. Field quality-control test reports.
- I. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
  - 1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
- J. Warranties: Special warranties specified in this Section.

**1.05 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with CEC.
- E. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- F. CBC Compliance: Comply with visibility and luminance requirements for exit signs.
- G. Mockups: Provide lighting fixtures for room or module mockups. Install fixtures for mockups with power and control connections.
  - 1. Obtain Architect's approval of fixtures for mockups before starting installations.
  - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

**1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Comply with Section 016550 - Delivery, Storage and Handling.

- B. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

**1.07 JOB CONDITIONS**

- A. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

**1.08 GUARANTEE / WARRANTY**

- A. Refer to Division 0 – Bidding and Contract Requirements.
- B. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
- C. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
- D. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
- E. Manufacturer's Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: One year from date of Substantial Completion.

**1.09 RELATED WORK / SECTIONS**

- A. Related Sections include but are not limited to the following:
  - 1. Section 262726 - Wiring Devices, for manual wall-box dimmers for incandescent lamps.

**1.10 OPERATION AND MAINTENANCE DATA**

- A. Submit as part of project closeout:
  - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
  - 2. Comply with Section 017700 - Contract Closeout.

**1.11 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 1 for every 10 of each type and rating installed. Furnish at least one of each type.
  - 2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Battery and Charger Data: One for each emergency lighting unit.
  - 4. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturer shall be one of the following and as herein listed and in Drawings:
  - 1. Refer to documents and as herein specified.
  - 2. Reviewed equivalent by Owner.
    - a. Substitutions and deviations shall require Owner's approval and shall be given in letterform.
    - b. Refer to Division 1, Section 013301– Submittals.

- c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
  - C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
  - D. Refer to drawings, details, and other related specification section whether listed or not.
  - E. Details shall set basic requirements for size and configuration of systems.
- 2.02 FIXTURES AND COMPONENTS, GENERAL
- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
  - B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
  - C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
  - D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
  - E. Metal Parts: Free of burrs and sharp corners and edges.
  - F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
  - G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
  - H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
    - 1. White Surfaces: 85 percent.
    - 2. Specular Surfaces: 83 percent.
    - 3. Diffusing Specular Surfaces: 75 percent.
    - 4. Laminated Silver Metallized Film: 90 percent.
  - I. Plastic Diffusers, Covers, and Globes:
    - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled
      - b. UV stabilized
    - 2. Glass: Annealed crystal glass, unless otherwise indicated.
  - J. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461D. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.
  - K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 15 Section "Diffusers, Registers, and Grilles."
    - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
    - 2. Heat Removal Units: Air path leads through lamp cavity.
    - 3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
    - 4. Dampers: Operable from outside fixture for control of return-air volume.
    - 5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

### 2.03 LIGHTING FIXTURES

- A. Fixture: See lighting fixture schedule on drawings.

### 2.04 FLUORESCENT LAMP BALLASTS

- A. Description: Include the following features, unless otherwise indicated:
  - 1. Designed for type and quantity of lamps indicated at full light output except for emergency lamps powered by in-fixture battery-packs.
  - 2. Externally fused with slow-blow type rated between 2.65 and 3.0 times the line current.
- B. Electronic ballasts for linear lamps shall include the following features, unless otherwise indicated:
  - 1. Comply with NEMA C82.11.

- 2. Ballast Type: Instant start, unless otherwise indicated.
  - 3. Programmed Start: Ballasts with two-step lamp starting to extend life of frequently started lamps.
  - 4. Sound Rating: A.
  - 5. Total harmonic distortion rating of less than 10 percent according to NEMA C82.11.
  - 6. Transient Voltage Protection: IEEE C62.41, Category A.
  - 7. Operating Frequency: 20 kHz or higher.
  - 8. Lamp Current Crest Factor: Less than 1.7.
  - 9. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
- C. Electromagnetic ballasts for linear lamps shall have the following features, unless otherwise indicated:
- 1. Comply with NEMA C82.1.
  - 2. Type: Energy-saving, high power factor, Class P, automatic-reset thermal protection.
  - 3. Ballast Manufacturer Certification: Indicated by label.
  - 4. Provide lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
- D. Ballasts for compact lamps in recessed fixtures shall have the following features, unless otherwise indicated:
- 1. Type: Electronic .
  - 2. Power Factor: 90 percent, minimum.
  - 3. Flicker: Less than 5 percent.
  - 4. Lamp Current Crest Factor: Less than 1.7.
  - 5. Electronic Ballast Operating Frequency: 20 kHz or higher.
  - 6. Lamp end-of-life detection and shutdown circuit.
  - 7. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  - 8. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- E. Ballasts for compact lamps in nonrecessed fixtures shall include the following features, unless otherwise indicated:
- 1. Power Factor: 90 percent, minimum.
  - 2. Ballast Coil Temperature: 65 deg C, maximum.
  - 3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  - 4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- F. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:
- 1. Dimming Range: 100 to 5 percent of rated lamp lumens.
  - 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
  - 3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.
- G. Ballasts for Low-Temperature Environments:
- 1. Temperatures 0 deg F and Higher: Electronic or electromagnetic type rated for 0 deg F minus 17 deg C starting temperature.
  - 2. Temperatures Minus 20 deg F minus 29 deg C and Higher: Electromagnetic type designed for use with high-output lamps.
- H. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

**2.05 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS**

- A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated.
- 1. Type: Constant-wattage autotransformer or regulating high-power-factor type.
  - 2. Minimum Starting Temperature: Minus 22 deg F minus 30 deg C for single-lamp ballasts.
  - 3. Normal Ambient Operating Temperature: 104 deg F 40 deg C.
  - 4. Open-circuit operation that will not reduce average life.

- B. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
- C. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.
- D. High-Pressure-Sodium Ballasts: Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.
  - 1. Instant Restrike Device: Solid-state potted module, mounted inside high-pressure-sodium fixture and compatible with high-pressure-sodium lamps, ballasts, and sockets up to 150 W.
    - a. Restrike Range: 105- to 130-V ac.
    - b. Maximum Voltage: 250-V peak or 150-V ac RMS.

**2.06 EXIT SIGNS**

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
  - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

**2.07 EMERGENCY LIGHTING UNITS**

- A. General: Self-contained units complying with UL 924.
  - 1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.
  - 5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.

**2.08 FLUORESCENT EMERGENCY LIGHTING FIXTURES**

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
  - 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  - 2. Night Light Connection: Operate one fluorescent lamp continuously.
  - 3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
  - 4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
  - 5. Charger: Fully automatic, solid-state, constant-current type.
- B. Central Type: Factory installed, full light output, fluorescent emergency ballast to operate lamps indicated from a remote emergency power source.
- C. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from light fixture. Comply with UL 924.
  - 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.



2. Night Light Connection: Operate one fluorescent lamp in a remote fixture continuously.
3. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
4. Charger: Fully automatic, solid-state, constant-current type.
5. Housing: NEMA 250, Class 1 enclosure.

**2.09 FLUORESCENT LAMPS**

- A. Low-Mercury Lamps: Comply with Federal toxic characteristic leaching procedure test, and yield less than 0.2 mg of mercury per liter, when tested according to NEMA LL 1.
- B. T8 rapid-start low-mercury lamps, rated 34W maximum, nominal length of 48 inches, 2950 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.
- C. T5 programmed start standard output and high output, rated 28 and 54 watts respectively. Nominal length shall be 45.8", 2900 and 5000 watts. CRI of 85, 3500k and average rated life of 20,000 hours.
- D. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature 3500, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.
  1. T4, Twin Tube: Rated 5 W, 250 initial lumens (minimum)
  2. T4, Twin Tube: Rated 7 W, 400 initial lumens (minimum)
  3. T4, Twin Tube: Rated 9 W, 600 initial lumens (minimum)
  4. T4, Twin Tube: Rated 13 W, 825 initial lumens (minimum)
  5. T4, Double-Twin Tube: Rated 13 W, 900 initial lumens (minimum)
  6. T4, Double-Twin Tube: Rated 18 W, 1200 initial lumens (minimum)
  7. T4, Double-Twin Tube: Rated 26 W, 1800 initial lumens (minimum)

**2.10 HIGH-INTENSITY-DISCHARGE LAMPS**

- A. High-Pressure-Sodium Lamps: NEMA C78.42, wattage and burning position as scheduled, CRI 21 (minimum), color temperature 1900, and average rated life of 24,000 hours.
- B. Low-Pressure-Sodium Lamps: NEMA C78.41.
- C. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 4000.

**2.11 FIXTURE SUPPORT COMPONENTS**

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage.
- E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

**2.12 FINISHES**

- A. Fixtures: Manufacturers' standard, unless otherwise indicated.
  1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
    - a. Color as approved by Owner.
  2. Metallic Finish: Corrosion resistant.
    - a. Color as approved by Owner.

## 2.13 LIGHTING CONTROL DEVICES

- A. Dimming Ballast Controls: Sliding-handle type with on/off control; compatible with ballast and having light output and energy input over the full dimming range.
- B. Light Level Sensor: Detect changes in ambient lighting level and provide dimming range of 20 to 100 percent in response to change.
  - 1. Sensor Capacity: At least 40 electronic dimming ballasts.
  - 2. Adjustable Ambient Detection Range: 10 to 100 fc minimum.
- C. Occupancy Sensors: Adjustable sensitivity and off delay time range of 5 to 15 minutes.
  - 1. Device Color:
    - a. Wall Mounted: White.
    - b. Ceiling Mounted: White.
  - 2. Occupancy detection indicator.
  - 3. Ultrasonic Sensors: Crystal controlled with circuitry that causes no detection interference between adjacent sensors.
  - 4. Infrared Sensors: With daylight filter and lens to afford coverage applicable to space to be controlled.
  - 5. Combination Sensors: Ultrasonic and infrared sensors combined.

## 2.14 SOURCE QUALITY CONTROL

- A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.
- B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

## PART 3 - EXECUTION

## 3.01 INSPECTION / EXAMINATION

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with general contractor to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

## 3.02 COORDINATION

- A. Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- B. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies. See architectural reflected ceiling plans and coordinate fixtures with ceiling types throughout the building.

## 3.03 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture. Remove all dirt, plaster, paint, etc., before work is accepted.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
  - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
  - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
  - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

- C. Suspended Fixture Support: As follows:
    - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
    - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
    - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
    - 4. Continuous Rows: Suspend from cable.
  - D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.
  - E. Adjust aimable fixtures to provide required light intensities.
- 3.04 CONNECTIONS
- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- 3.05 FIELD QUALITY CONTROL
- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
  - B. Verify normal operation of each fixture after installation.
  - C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
  - D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
  - E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.
- 3.06 PROTECTION AND CLEAN UP
- A. Keep areas of work free from debris as work progresses.
    - 1. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste and debris do not interfere with the work of others.
  - B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
  - C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no cost to the Owner.
  - D. After completion of work in this section, remove all erection equipment and implements of service, and debris.
    - 1. Leave entire area in a neat, clean, acceptable condition.
  - E. Provide record drawings in accordance with Section 017840 - Record Drawings.

END OF SECTION

**PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Exterior luminaires with lamps and ballasts, but not mounted on exterior surfaces of buildings.
  - 2. Luminaire-mounted photoelectric switches.
- B. Related Sections include the following:
  - 1. Division 2 Section "Lighting Poles and Standards" for poles and other support structures and for requirements of resistance to wind loads.
  - 2. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

**1.02 SUBMITTALS**

- A. Product Data: For each luminaire, arranged in the order of lighting unit designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of fixture, including dimensions and verification of indicated parameters.
  - 2. Luminaire dimensions, effective projected area, details of attaching luminaires, accessories, and installation and construction details.
  - 3. Luminaire materials.
  - 4. Photoelectric relays.
  - 5. Fluorescent and high-intensity-discharge ballasts.
  - 6. Fluorescent and high-intensity-discharge lamps.
  - 7. Electrical and energy-efficiency data for ballasts.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.
- C. Wiring Diagrams: Power, signal, and control wiring.
- D. Coordination Drawings: Mounting and connection details, drawn to scale, for exterior luminaires with requirements specified in Division 2 Section "Lighting Poles and Standards."
- E. Samples for Verification: For exterior luminaires designated for sample submission in the Exterior Luminaire Schedule.
  - 1. Lamps: Specified units installed.
  - 2. Ballast: 120-V models of specified ballast types.
  - 3. Finishes: For each finished metal used in support components.
- F. Source quality-control test reports.
- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For luminaires to include in maintenance manuals.
- I. Warranties: Special warranties specified in this Section.

**1.03 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- E. Comply with IEEE C2, "National Electrical Safety Code."
- F. Comply with CEC.

**1.04 COORDINATION**

- A. Coordinate exterior luminaires with mounting and wind load requirements in Division 2 Section "Lighting Poles and Standards."

**1.05 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace luminaires or components of luminaires and lamps that fail in materials or workmanship; corrode; or fade, stain, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
  - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
    - a. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
    - b. Warranty Period for Color Retention: Five years from date of Substantial Completion.
  - 2. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.

**1.06 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Ballasts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 4. Globes and Guards: 10 for every 20 of each type and rating installed. Furnish at least one of each type.

**PART 2 - PRODUCTS****2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

**2.02 LUMINAIRES, GENERAL**

- A. Complying with UL 1598 and listed for installation in wet locations.
- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.

- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

#### 2.03 PHOTOELECTRIC RELAYS

- A. UL 773 or UL 773A listed, factory mounted to the luminaire.
- B. Contact Relays: Single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Contacts shall have directional lens in front of photocell to prevent fixed light sources to cause turnoff.
  - 1. Relay with locking-type receptacle shall comply with NEMA C136.10.
  - 2. Adjustable window slide for adjusting on-off set points.

#### 2.04 FLUORESCENT LAMP BALLASTS

- A. Ballasts shall be suitable for low-temperature environments.
  - 1. Temperatures 0 Deg F and Higher: Electronic or electromagnetic type rated for 0 deg F starting temperature.
  - 2. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  - 3. Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with high-output lamps.
- B. Ballasts for compact lamps shall be suitable for cold-weather starting and shall include the following:
  - 1. Power Factor: 90 percent, minimum.
  - 2. Ballast-Coil Temperature: 65 deg C, maximum.
  - 3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.

#### 2.05 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated:
  - 1. Type: Constant-wattage autotransformer or regulating high-power-factor type.
  - 2. Minimum Starting Temperature: Minus 22 deg F for single-lamp ballasts.
  - 3. Normal Ambient Operating Temperature: 104 deg F.
  - 4. Open-circuit operation will not reduce average life.
  - 5. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
- B. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
- C. High-Pressure-Sodium Ballasts: Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.
  - 1. Instant Restrike Device: Solid-state potted module, mounted inside high-pressure-sodium fixture and compatible with high-pressure-sodium lamps, ballasts, and sockets up to 150 W.
    - a. Restrike Range: 105- to 130-V ac.
    - b. Maximum Voltage: 250-V peak or 150-V ac RMS.
  - 2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
  - 3. Open-circuit operation will not reduce average life.

#### 2.06 HIGH-INTENSITY-DISCHARGE LAMPS

- A. High-Pressure-Sodium Lamps: NEMA C78.42, wattage and burning position as scheduled, CRI 21 (minimum), color temperature 1900, and average rated life of 24,000 hours.
- B. Low-Pressure-Sodium Lamps: Not allowed.
- C. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 4000.

#### 2.07 FACTORY FINISHES

- A. Field Painting Finish: Manufacturer's standard prime-coat finish ready for field painting.

- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match process and color of pole or support materials specified in Division 2 Section "Lighting Poles and Standards."
  - C. Factory-Painted Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
    - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
    - 2. Interior Surfaces: Apply one coat of bituminous paint on interior of pole, or otherwise treat to prevent corrosion.
    - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      - a. Color: As selected from manufacturer's standard catalog of colors.
      - b. Color: Match Architect's sample of manufacturer's standard color.
      - c. Color: As selected by Architect from manufacturer's full range.
  - D. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
    - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
    - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
- 2.08 SOURCE QUALITY CONTROL
- A. Provide services of a qualified, independent testing and inspecting agency to factory test luminaires with ballasts and lamps; certify results for isofootcandle curves, zonal lumen, average and minimum ratios, and electrical and energy-efficiency data for ballasts.
  - B. Factory test fixtures with ballasts and lamps; certify results for isofootcandle curves, zonal lumen, average and minimum ratios, and electrical and energy-efficiency data for ballasts.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install lamps in each fixture.
- B. Luminaire Attachment: Fasten to indicated structural supports.
- C. Adjust luminaires that require field adjustment or aiming.

#### 3.02 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

#### 3.03 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
  - 1. IESNA LM-5.
  - 2. IESNA LM-50.
  - 3. IESNA LM-52.
  - 4. IESNA LM-64.
  - 5. IESNA LM-72.
- C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract Documents, including Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Fire-alarm control unit.
  - 2. Manual fire-alarm boxes.
  - 3. System smoke detectors.
  - 4. Heat detectors.
  - 5. Notification appliances.
  - 6. Addressable interface device.
  - 7. Digital alarm communicator transmitter.
  - 8. System printer.

**1.3 DEFINITIONS**

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

**1.4 SYSTEM DESCRIPTION**

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

**1.5 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

**1.6 SUBMITTALS**

- A. General Submittal Requirements:



1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
  2. Shop Drawings shall be prepared by persons with the following qualifications:
    - a. Trained and certified by manufacturer in fire-alarm system design.
    - b. NICET-certified fire-alarm technician, Level III minimum.
    - c. Licensed or certified by authorities having jurisdiction.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
  2. Include voltage drop calculations for notification appliance circuits.
  3. Include battery-size calculations.
  4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  5. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
  2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.
- E. Qualification Data: For qualified Installer.
- F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Field quality-control reports.
- H. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
  3. Record copy of site-specific software.

4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
  - a. Frequency of testing of installed components.
  - b. Frequency of inspection of installed components.
  - c. Requirements and recommendations related to results of maintenance.
  - d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

I. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.
- F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.
- G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.

### 1.8 SEQUENCING AND SCHEDULING

- A. As new equipment is installed, Label it "NOT IN SERVICE" until it is accepted.

### 1.9 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.

- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
  - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

#### 1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
  - 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
  - 3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
  - 4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
  - 5. Keys and Tools: One extra set for access to locked and tamperproofed components.
  - 6. Audible and Visual Notification Appliances: One of each type installed.
  - 7. Fuses: Two of each type installed in the system.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide NOTIFIER NFS-640 system or comparable product by one of the following:
  - 1. Notifier
  - 2. Silent Knight; a Honeywell company.
  - 3. Fire Lite Alarms; a Honeywell company.
  - 4. Faraday; Siemens Building Technologies, Inc.
  - 5. Fire Control Instruments, Inc.; a Honeywell company.
  - 6. GE Infrastructure; a unit of General Electric Company.
  - 7. Gentex Corporation.
  - 8. Siemens Building Technologies, Inc.; Fire Safety Division.

## 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
1. Manual stations.
  2. Heat detectors.
  3. Smoke detectors.
- B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
  2. Identify alarm at fire-alarm control unit.
  3. Transmit an alarm signal to the remote alarm receiving station.
  4. Record events in the system memory.
- C. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
  2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  3. Loss of primary power at fire-alarm control unit.
  4. Ground or a single break in fire-alarm control unit internal circuits.
  5. Abnormal ac voltage at fire-alarm control unit.
  6. Break in standby battery circuitry.
  7. Failure of battery charging.
  8. Abnormal position of any switch at fire-alarm control unit.
- D. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit. Record the event on system printer.

## 2.3 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
    - a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
    - b. Include a real-time clock for time annotation of events on the event recorder and printer.
  2. Addressable initiation devices that communicate device identity and status.
    - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
    - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
  3. Addressable control circuits for operation of mechanical equipment.

- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
  2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- C. Circuits:
1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
    - a. Initiating Device Circuits: Style D
    - b. Notification Appliance Circuits: Style Z.
    - c. Signaling Line Circuits: Style 2.
    - d. Install no more than 50 addressable devices on each signaling line circuit.
  2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
    - a. Initiating Device Circuits: Style A
    - b. Notification Appliance Circuits: Style Y.
    - c. Signaling Line Circuits: Style 0.5.
    - d. Install no more than 50 addressable devices on each signaling line circuit.
  3. Serial Interfaces: Two RS-232 ports for printers.
- D. Smoke-Alarm Verification:
1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
  2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
  3. Record events by the system printer.
  4. Sound general alarm if the alarm is verified.
  5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
- E. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- F. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.
- G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

- H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
  - 1. Batteries: Sealed lead calcium.
- I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## 2.4 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
  - 2. Station Reset: Key- or wrench-operated switch.
  - 3. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

## 2.5 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
  - 1. Comply with UL 268; operating at 24-V dc, nominal.
  - 2. Detectors shall be two-wire type.
  - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  - 4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
  - 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  - 6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
  - 7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
    - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
    - c. Provide multiple levels of detection sensitivity for each sensor.
- B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

## 2.6 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of **135 deg F (57 deg C)** or a rate of rise that exceeds **15 deg F (8 deg C)** per minute unless otherwise indicated.
1. Mounting: Adapter plate for outlet box mounting.
  2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of **190 deg F (88 deg C)**.
1. Mounting: Adapter plate for outlet box mounting.
  2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- D. Continuous Linear Heat-Detector System:
1. Detector Cable: Rated detection temperature [**155 deg F (68 deg C)**] NRTL listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short-circuit wires at the location of elevated temperature.
  2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.

3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.7 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
  1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.
- D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
  1. Rated Light Output:
    - a. 30 and 110 cd.
    - b. 15/30/75/110 cd, selectable in the field.
  2. Mounting: Wall mounted unless otherwise indicated.
  3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  4. Flashing shall be in a temporal pattern, synchronized with other units.
  5. Strobe Leads: Factory connected to screw terminals.
  6. Mounting Faceplate: Factory finished, red or white.

## 2.8 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

## 2.9 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.



- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
  - 1. Verification that both telephone lines are available.
  - 2. Programming device.
  - 3. LED display.
  - 4. Manual test report function and manual transmission clear indication.
  - 5. Communications failure with the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
  - 1. Address of the alarm-initiating device.
  - 2. Address of the supervisory signal.
  - 3. Address of the trouble-initiating device.
  - 4. Loss of ac supply or loss of power.
  - 5. Low battery.
  - 6. Abnormal test signal.
  - 7. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

**2.10 SYSTEM PRINTER**

- A. Printer shall be listed and labeled by an NRTL as an integral part of fire-alarm system.

**2.11 DEVICE GUARDS**

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
  - 1. Factory fabricated and furnished by manufacturer of device.
  - 2. Finish: Paint of color to match the protected device.
  - 3. Weatherproof.

## PART 3 - EXECUTION

## 3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, 2002 Edition for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
  - 1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
  - 2. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Smoke- or Heat-Detector Spacing:
  - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
  - 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
  - 3. Smooth ceiling spacing shall not exceed **30 feet (9 m)**.
  - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
  - 5. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.
- D. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- E. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.
- F. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- G. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

## 3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

## 3.3 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

## 3.4 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by State Fire Marshal.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
  - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
  - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

## 31 00 00 EARTHWORK

## 31 20 00 EARTH MOVING

Shall be in accordance to the El Dorado County standard plans and ordinances. All earthwork, fill, aggregate base and asphalt concrete shall be placed, compaction and constructed in accordance with the recommendations outlined in the Headington Road Maintenance Yard Improvements, Foundation Design Criteria document prepared by Youngdahl Consulting Group dated August 18, 2005 and the Foundation Design Criteria Update dated December 7, 2011.

## 31 22 00 Grading

## 31 22 19 Finish Grading

Grading tolerances for building pads shall be plus or minus ½ inch measured with a 10 foot straight edge.

Shall be performed to the elevations specified in the improvement plans.

## 31 23 00 Excavation and Fill

## 31 23 13 Subgrade Preparation

The upper 8 inches of subgrade soil under pavement sections shall be compacted to a minimum relative compaction of 95 percent based on the ASTM D1557 test method at a moisture content above optimum.

## 31 23 16 Excavation

Shall be in accordance to the El Dorado County Standard Plans, Ordinances and as outlined in the Headington Road Maintenance Yard Improvements, Foundation Design Criteria document prepared by Youngdahl Consulting Group dated August 18, 2005, and the Foundation Design Criteria Update dated December 7, 2011.

Remove all rock to required depth of footing bearing as indicated on structural and architectural drawings and to the extent shown on the improvement plans.

For the purposes of bidding, it is anticipated that no unsuitable materials will be encountered. Therefore, overexcavation is not anticipated.

## 31 23 23 Fill

Shall be place in thin horizontal lifts not to exceed 12 inches in uncompacted thickness. Shall be compacted to at least 95 percent of the maximum dry density based on ASTM D1557.

## 31 23 33 Trenching and Backfilling

Shall be in accordance to the El Dorado County and El Dorado Irrigation District standard plans, specifications, and ordinances. EID technical specifications can be found online at:

[http://www.eid.org/doc/lib/02\\_dist\\_info/TechnicalSpecifications.pdf](http://www.eid.org/doc/lib/02_dist_info/TechnicalSpecifications.pdf)

Shall be compacted to at least 90 percent of the maximum dry density based on ASTM D1557 and El Dorado Irrigation District Technical Specifications 02221 –

### 3.3 Backfill and Compaction.

Structural Excavation and Backfill for Sanitary Sewer Manholes: El Dorado Irrigation District Technical Specifications 02220.

Pipe Bedding and Backfill material shall be per El Dorado Irrigation District Technical Specifications 02221 – 2.0 Materials.

#### 31 23 43 Trench and Excavation Safety

Comply with OSHA 29 CFR Part 1926 Construction Industry Regulations, Construction Safety Orders of the California Division of Occupational Safety and Health, and Labor Code Section 6705.

For all excavations 5 feet or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Owner.

Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.

No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.

If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.

END OF SECTION

32 00 00 EXTERIOR IMPROVEMENTS

32 10 00 BASES, BALLASTS, AND PAVING

Shall be in accordance to the El Dorado County standard plans, specifications, and ordinances.

32 11 00 Base Courses

32 11 23 Aggregate Base Courses

Aggregate Base must meet specifications of CalTrans Class 2 Aggregate Base ("R" – Value =78).

Aggregate base course thickness per structural plans, civil improvement plans and geotechnical recommendations.

Aggregate base shall be compacted to 95 percent of the maximum dry density based on ASTM D1557

32 12 00 Flexible Paving

32 12 16 Asphalt Paving

Asphalt concrete must meet the specifications for CalTrans Type B Asphaltic Concrete.

Asphalt concrete section per civil improvement plans and geotechnical specifications.

Asphalt concrete shall be placed in accordance with Caltrans 2006 Standard Specifications, Section 39 Asphalt Concrete and the direction of the Engineer.

Saw-cutting of existing Asphalt Paving shall be done in accordance with Caltrans 2006 Standard Specifications.

32 13 00 Rigid Paving

32 13 13 Concrete Paving

Concrete paving shall meet 3,500 psi at 28 day minimum compressive strength per ASTM C 39.

Reinforcing steel as required by the geotechnical engineer and structural drawings.

Construction tolerance of finish surface shall be 1/8 inch in 10 feet for grade and alignment of forms. 1/4 inch in 10 feet for vertical face on longitudinal axis.

END OF SECTION

## 33 00 00 UTILITIES

## 33 10 00 WATER UTILITIES

Shall be in accordance to the El Dorado Irrigation District technical plans, specifications, and ordinances. EID technical specifications can be found online at:

[http://www.eid.org/doc\\_lib/02\\_dist\\_info/TechnicalSpecifications.pdf](http://www.eid.org/doc_lib/02_dist_info/TechnicalSpecifications.pdf)

## 33 11 00 Water Distribution Piping

Pipe shall be meet AWWA C900, Class 150, 200 and schedule 40. Thrust blocks shall be constructed per El Dorado Irrigation District Specification 02622.

For testing and disinfecting water lines: Section 02660.

For abandonment of water utilities: Section 02670.

Minimum working water pressure

- a. Underground piping: 150 psig (1035 kPa)
- b. Underground piping, downstream of Fire Department Connections: 200 psig (1380 kPa)

## 33 30 00 SANITARY SEWERAGE UTILITIES

Shall be in accordance to the El Dorado Irrigation District technical plans, specifications, and ordinances.

Connections to existing sewer facilities shall be done by a licensed contractor in accordance with tie-in procedures per EID Technical Specification 01000.

For Abandonment of Facilities: El Dorado Irrigation District standards and Specification Section 02670.

## 33 33 00 Low Pressure Utility Sewerage

Pipe shall be ABS (ASTM D2751) or SDR 35. Joints shall be solvent welded.

## 33 39 00 Sanitary Utility Sewerage Structures

## 33 39 13 Sanitary Utility Manholes, Frames, and Covers

Structures shall comply with El Dorado Irrigation District standards and specification 02623.

Manholes shall be precast 48 inches in diameter with 24 inches access frame and cover. Frame and cover shall be traffic rated. Specification 02601.

For sanitary sewer system testing: Section 02661.

## 33 39 23 Sanitary Utility Sewerage Cleanouts



Cleanout shall comply with the El Dorado Irrigation District standards and specifications.

Cleanout materials shall be ABS (ASTM D2751) or SDR 35. Joints shall be solvent welded.

33 40 00

**STORM DRAINAGE SYSTEM**

Shall be in accordance to the El Dorado County standard plans, specifications, and ordinances.

33 41 00 Storm Utility Drainage Piping

Storm drain pipe and fittings shall be smooth interior HDPE or PVC, in accordance with Caltrans Standard, 2006; Section 64.

END OF SECTION