

# THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

A SPECIAL DISTRICT OF THE STATE OF CALIFORNIA



Napa County Regional Park  
and Open Space District

Contract Documents

*for the*

## ***Camp Berryessa Improvement Project***

<b>Date Issued:</b>	July 28, 2014
<b>Pre-Bid Job Walk:</b>	Friday, August 22, 2014 10:00 A.M.
<b>Bids Due:</b>	Monday, September 15, 2014 10:00 A.M.
<b>Bid Submittal Location:</b>	County of Napa Dept. of Planning, Building, & E.S. Front Counter, 2 <sup>nd</sup> Floor 1195 Third Street Napa, Calif. 94559

***NOTE:*** CONTRACTOR shall possess a Class A General Contractors License at the time of bidding and shall be skilled and regularly engaged in the general class or type of work called for under the Contract.

**Napa County Regional Park and Open Space District  
1195 Third Street, Second Floor  
Napa, Calif. 94559  
(707) 299-1335**

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## PUBLIC NOTICE

### THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT A SPECIAL DISTRICT OF THE STATE OF CALIFORNIA

*hereby gives*

#### **NOTICE TO CONTRACTORS OF AN INVITATION FOR BIDS** *for the* **CAMP BERRYESSA IMPROVEMENT PROJECT**

The General Manager, on behalf of and as authorized by the Napa County Regional Park and Open Space District ("District"), will receive sealed Bid Proposals for the Camp Berryessa Improvement Project. Bid Proposals shall be submitted under sealed cover, plainly marked as a bid, and shall clearly identify the project to which the bid relates. Bids which are not properly marked may be rejected. **Sealed bids must be submitted to the offices of the Napa County Department of Planning, Building, and Environmental Services, Second Floor, Napa County Administration Building, 1195 Third Street, Napa, California, by 10:00 A.M. on Monday, September 15, 2014.** Bid proposals will be opened immediately thereafter, in the Planning Division conference room on the second floor of the Napa County Administration Building and referred to the District Board of Directors for formal awarding at their next meeting.

Bids are required for the entire work called for by the Plans and Specifications, and neither partial nor contingent bids will be considered. Contract documents, plans, and specifications (excluding State Standard Specifications and other documents which may be included by reference) are available for purchase at Frye's Printing, 1050 Lincoln Avenue, Napa, Calif 94558. Phone (707) 253-1114. Documents may also be downloaded at <http://www.napaoutdoors.org/documents/camp-berryessa-bid>. Contract Proposals must be submitted on the forms furnished by the District and completed in their entirety, including (without limitation) the completed Bid Sheet, Bond Forms, Bid Security, and Contract Proposal. Each bid must be signed in ink by an authorized representative of the bidder and must include the legal name of the bidder. Any proposal which is incomplete may be rejected.

No bid will be accepted from a bidder who is not licensed in the State of California as a Class "A" General Engineering Contractor (in accordance with the provisions of Division 3, Chapter 9, of the Calif. Business and Professions Code). Each bidder is responsible for viewing the complete Plans and Specifications prior to submitting a bid. A **mandatory** pre-bid conference will be held on **Friday, August 22, 2014 10:00 A.M.** at the Camp Berryessa job site off of Berryessa-Knoxville Road, adjacent to Lake Berryessa and just north of the Putah Creek Bridge.

**All questions must be mailed or e-mailed to Chris Cahill (ccahill@ncrposd.org) Napa County Regional Park and Open Space District, 1195 Third St., Second Floor, Napa, Calif. 94559 by 4:45 p.m. on Friday, August 29, 2014.** Permits for this work will be secured by the District and are not a part of the bid.

The District has obtained the general prevailing rate of per diem wages, in accordance with law, to be paid for the construction of the above-entitled improvements. The District reserves the right, without making findings or stating reasons and at no obligation of the District to any bidder, to reject all bids and, if so, to re-advertise, to accomplish the work by District force account, and/or to buy the materials on the open market.

DATED: JULY 28, 2014

JOHN WOODBURY  
GENERAL MANAGER  
THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

# THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

## NOTICE INVITING BIDS *for the* Camp Berryessa Improvement Project

PUBLIC NOTICE IS HEREBY GIVEN that the General Manager, on behalf of and as authorized by the **NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT** ("DISTRICT"), will receive sealed Bid Proposals up to the hour of **10:00 A.M.** on **September 15, 2014**. Proposals will be opened immediately thereafter, in the Planning Division conference room on the second floor of the Napa County Administration Building (1195 Third Street, Napa) and referred to the DISTRICT Board of Directors for formal awarding at their next public meeting.

Proposals must be sealed and should be addressed as follows:

**NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT**  
c/o County of Napa  
Department of Planning, Building, and Environmental Services  
Front Counter, 2<sup>nd</sup> Floor  
1195 Third Street  
Napa, Calif. 94559

### WORKS OF IMPROVEMENT

The work is located at 7900 Berryessa-Knoxville Road, Napa, Calif. 94558

The project consists of the construction of an environmental education camp including grading; paving of roadways, parking lots and trails; water system, water treatment, tank, and distribution, greywater system with subsurface drip disposal; camp host site; tent cabins; combination restroom shower building with composting toilets; covered activity areas; boat boarding dock; electrical system with photovoltaic array; and miscellaneous other site improvements/modifications. Permits for this work will be secured by the District.

**Construction must be completed by December 1, 2014. The District's cost estimate for the project is \$1,429,500.**

### PLANS AND SPECIFICATIONS

All of the above work is to be done under contract, in accordance with those certain plans, specifications, and drawings contained within and accompanying the CONTRACT DOCUMENTS available for purchase at Frye's Printing, 1050 Lincoln Avenue, Napa, C<sup>alif</sup> 94558. Phone (707) 253-1114. Documents may also be downloaded at <http://www.napaoutdoors.org/documents/camp-berryessa-bid>. DISTRICT and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

Complete sets of Bidding Documents shall be used in preparing bids; neither DISTRICT nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

### EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

#### **Subsurface and Physical Conditions**

A. The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.

2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced herein will be made available by DISTRICT to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in the General Conditions has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

#### **Underground Facilities**

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to DISTRICT and Engineer by owners of such Underground Facilities, including DISTRICT, or others.

#### **Hazardous Environmental Condition**

A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in herein will be made available by DISTRICT to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in the General Conditions has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

#### **Provisions concerning responsibilities for the adequacy of data**

Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in the General Conditions.

#### **Access to the Site to conduct examinations**

On request, DISTRICT will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to locating of excavation and utility.

#### **Additional DISTRICT Provided Information:**

A. Reference is made to Section 01010, Summary of Work and Work Restrictions, for the identification of the general nature of other work that is to be performed at the Site by DISTRICT or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, DISTRICT will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

B. The General Conditions states that if an Owner safety program exists it will be noted in the Supplementary Conditions.

## **Responsibility of Each Bidder**

It is the responsibility of each Bidder before submitting a Bid to:

- A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;
- B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. Become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. Carefully study all:
  - 1. Reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in the General Conditions, and
  - 2. Reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in the Supplementary Conditions as provided in the General Conditions;
- E. Obtain and carefully study (or accept consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
- F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
- G. Become aware of the general nature of the work to be performed by DISTRICT and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
- I. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
- J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

## **Incontrovertible Representation**

The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid is premised upon performing and furnishing the Work

required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

#### BID OPENING

All timely-received sealed bids will be opened publicly by the General Manager or his designee in the presence of one or more witnesses at the time indicated at "Bids Due" and the place designated at "Bid Submittal Location", above, or as soon thereafter as is possible. The only information that will be read aloud at that time and place is the information that will be recorded in the bid abstract; details of any bid's exceptions or nonconformance will not be read in public although the fact of their existence may be publicly noted. While the actual bid documents will not be examined by bidders or the public at the bid opening, the District assumes no responsibility for the confidentiality of bid information.

#### BID ABSTRACT CONTENTS

The following information shall be recorded in the bid abstract, which shall be signed by the opener and witness: the bidders' company name and location, bid prices, the presence of addenda and exceptions, other pertinent information such as delivery terms, the promised delivery date, and payment terms.

#### CONTRACT PROPOSALS

Contract Proposals must be submitted on the forms furnished by the DISTRICT. The Contract Proposal must be completed in its entirety, including the completed Bid Sheet, Bond Forms, Bid Security, and Contract Proposal. Each bid must be signed in ink by an authorized representative of the vendor and include the legal name of the bidder. Any proposal which is incomplete may be rejected. Each bidder is responsible for viewing the complete plans and specifications prior to submitting a bid.

#### LICENSE and EXPERIENCE

No bid will be accepted from a bidder who is not licensed in the State of California as a Class "A" General Engineering CONTRACTOR, (licensed in accordance with the provisions of Division 3, Chapter 9, of the Business and Professions Code of the State of California). CONTRACTOR shall be skilled and regularly engaged in the general class or type of work called for under the Contract to bid this Project.

To demonstrate Bidder's qualifications to perform the Work, within five days of DISTRICT's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below:

- A. Construction Contractor's Qualification Statement For Engineered Construction, AGC 220 (Attached).

Submission of qualifications under this paragraph does not prejudice the right of DISTRICT to seek additional pertinent information as may be provided elsewhere herein.

#### PERFORMANCE and LABOR/MATERIALS BONDS

The successful CONTRACTOR will be required to furnish, with the Agreement, a Faithful Performance Bond in the amount of one hundred percent (100%) of the aggregate amount of the bid, and a Payment for Labor and Materials Bond in the amount of one hundred per cent (100%) of the aggregate amount of the bid. The successful CONTRACTOR shall also furnish Certificates of Insurance evidencing that all insurance coverage required by the CONTRACT DOCUMENTS has been so secured.

#### PREVAILING WAGES and APPRENTICESHIP

The DISTRICT has obtained the general prevailing rate of per diem wages, in accordance with law, to be paid for the



construction of the above-entitled improvements. The schedule has been obtained from the Director of the Department of Industrial Relations pursuant to the provisions of §1773 et seq. of the Labor Code of the State of California and reference is hereby made to copies thereof set forth at <https://www.dir.ca.gov/OPRL/PWD/index.htm> and on file with DISTRICT. CONTRACTOR shall ensure that copies are posted at each job site during the course of construction.

The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are set forth at <http://www.dol.gov/whd/minimumwage.htm> and incorporated herein by reference.

Attention is directed to the Federal minimum wage rate requirements noted above. Where there is a difference between the minimum wage rates predetermined by the US 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, the 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 rated determination otherwise available for use by the CONTRACTOR and subcontractors, the CONTRACTOR and subcontractors shall pay not less than the Federal minimum wage rate, which most closely approximates the duties of the employees in question.

The contract entered into with the successful bidder will include the requirement to comply with the payroll record requirements of Labor Code §1776; that, if the contract is for \$30,000 or more, the successful bidder will be required to comply with the apprenticeship requirements of Labor Code §1777.5. Pursuant to Public Contract Code §6109, no contract will be awarded to a bidder who is ineligible to bid or work on or be awarded a public works project because the bidder has been found to be in noncompliance with the prevailing wages laws pursuant to Labor Code §§1777.1 or 1777.7 or proposes to use a subcontractor who is likewise barred pursuant to said sections. The DISTRICT has contracted with a labor compliance manager for this project.

#### PAYMENT

Payments will be made to the CONTRACTOR, in accordance with the provisions of the CONTRACT DOCUMENTS, on itemized estimates duly certified and approved by the Project Engineer and submitted in accordance therewith, based on labor and materials incorporated into said work during the preceding month. Securities may be substituted by the CONTRACTOR for moneys withheld as retention by the DISTRICT to ensure the performance of the works of improvement.

#### BID SECURITY (BIDDER'S BOND REQUIRED)

All Contract Proposals shall be accompanied by a cashier's or certified check payable to the Napa County Regional Park and Open Space District, amounting to ten per cent (10%) of the aggregate amount of the bid, or by a Bid Bond in said amount, on the form included within the Contract Proposal. Said check shall be forfeited, or said bond shall become payable, in case the Bidder depositing same does not complete the requirements as defined in the CONTRACT DOCUMENTS in the time set forth herein below.

Although the District will endeavor to return bid bonds or bid deposits, except those of the three lowest bidders, as soon as practical following the bid opening and checking of bids, the bid bond of the lowest bidder must be retained until the contract has been executed and approved and any performance and/or payment bonds and certificate of insurance provided, at which time the bid bond will be released except where forfeited. The bidder's security posted by the second and third lowest responsive and responsible bidders will likewise be retained until the contract has been fully executed and insurance certificates are obtained from the successful bidder due to the possibility of the award being given to either the second or third lowest responsive and responsible bidders if all of the prior responsive and responsible low bidders default.

Failure by the successful bidder within the time allowed to execute the contract or comply with any other requirement imposed precedent to execution of the contract shall be considered just cause for cancellation of the award and forfeiture of the bid security, not as a penalty but in liquidation of certain damages sustained, and that the contract award may then be made to the next lowest responsive and responsible bidder, the call for bids re-advertised, or such other action taken as deemed appropriate by the General Manager or Board.

Relief of bidders who have submitted bids containing errors shall be governed pursuant to the procedures in Public Contracts Code §5100 et seq.

#### RESPONSIVE BIDS

For purposes of this project, a bid shall be deemed to be “responsive” when the bidder has complied with the terms, conditions, provisions, specifications, instructions, and all other requirements of this notice inviting bids and of required bid forms. Criteria such as required delivery time, delivery instructions, the timely submission of quotations, and those other factors noted herein may be used to determine whether a bid is considered responsive. The determination whether a bid is responsive is an administrative decision, which shall be made by the General Manager after the receipt and evaluation of quotations.

#### MODIFICATION OR WITHDRAWAL OF BIDS

A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

If within 24 hours after Bids are opened any Bidder files a duly signed written notice with DISTRICT and promptly thereafter demonstrates to the reasonable satisfaction of DISTRICT that there was an excusable, material, and substantial mistake in the preparation of its Bid and that the following conditions are met:

1. Written notice of the mistake, specifying in detail how the mistake occurred, is received by DISTRICT within 24 hours after the opening of bids;
2. The mistake makes the bid materially different from what the bidder intended it to be;
3. The mistake was made in filling out the bid and is not due to an error in judgment, carelessness in inspecting the site of the work, or carelessness in reading the Drawings or Specifications;

then that Bidder may withdraw its Bid, and the Bid security will be returned.

Thereafter, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the Work.

#### CLAYTON ACT and CARTWRIGHT ACT

As required by Public Contract Code §7103.5(b), in entering into a public works contract or a subcontract to supply goods, services, or materials for the erection, construction, alteration, repair or improvement of any structure, building, road or other improvement, the contractor or subcontractor offers and agrees to assign to DISTRICT all rights, title, and interest in and to all causes of action the contractor or subcontractor may have under §4 of the Clayton Act (15 U.S.C. §15) or under the Cartwright Act (Chapter 2 commencing with §16700 of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or subcontract, and that this assignment shall be made and become effective at the time DISTRICT tenders final payment to the contractor, without further acknowledgement by the parties. Bidders must execute and submit with the bid the Non-Collusion Affidavit as set forth below on page 26 of the Contract Documents.

#### SUBCONTRACTOR LISTING

Any bidder who will be using subcontractors to perform part of the work shall state in the bid the name and location of the place of business of, and the portion of the work that will be done by each subcontractor (listing only one for each portion of the work) who will perform work or render service to the prime contractor as part of construction of the work, or of each subcontractor licensed by the State of California who, under subcontract to the prime contractor, will specially fabricate and install a portion of the work according to detailed drawings in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor’s total bid or, in the case of street, highway or bridge construction, in excess of one-half of 1 percent of the prime contractor’s total bid or ten thousand dollars, whichever is greater.

#### HANDLING of CONSTRUCTION CLAIMS

Construction claims to be handled consistent with State law, to wit;

**§ 20104. Application of article; "Public work"; "Claim"**

**(a) (1)** This article applies to all public works claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between a contractor and a local agency.

**(2)** This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

**(b) (1)** "Public work" has the same meaning as in Sections 3100 and 3106 of the Civil Code, except that "public work" does not include any work or improvement contracted for by the state or the Regents of the University of California.

**(2)** "Claim" means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

**(c)** The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.

**(d)** This article applies only to contracts entered into on or after January 1, 1991.

**§ 20104.2. Requirements to submit claim; Agency's response; Dispute by claimant over response; Failure of agency to respond; Inapplicability of article to tort claims**

For any claim subject to this article, the following requirements apply:

**(a)** 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 contract for the filing of claims.

**(b) (1)** For claims of less than fifty thousand dollars (\$50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

**(2)** If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

**(3)** The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

**(c) (1)** For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the local agency shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

**(2)** If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

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

**(d)** If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency'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 local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

**(e)** Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

**(f)** This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change

the time periods for filing tort claims or actions specified by 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.

**§ 20104.4. Procedures to resolve claims**

The following procedures are established for all civil actions filed to resolve claims subject to this article:

**(a)** Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

**(b) (1)** If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act (Title 4 (commencing with Section 2016.010) of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

**(2)** Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

**(3)** In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, pay the attorney's fees of the other party arising out of the trial de novo.

**(c)** The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

**§ 20104.6. Payment of portion of claim which is undisputed; Payment of interest on arbitration award or judgment**

**(a)** No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

**(b)** In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

GENERAL INFORMATION

CONTRACT DOCUMENTS, plans, and specifications (excluding State Standard Specifications and other documents included by reference) are available as noted at PLANS AND SPECIFICATIONS, above. A **mandatory** pre-bid conference will be held on **Friday, August 22, 2014 10:00 A.M.** at the Camp Berryessa job site off of Berryessa-Knoxville Road. DISTRICT will transmit to Bidders of record such addenda as it deems necessary in response to questions arising at the conference. Technical questions and Requests for Information will not be accepted after **Friday, August 29, 2014**. Permits for this work will be secured by the District.

The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by DISTRICT unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

REJECTION OF BIDS- ALTERNATIVE PROCUREMENT METHODS

DISTRICT reserves the right, without making findings or stating reasons and at no obligation of the District to any bidder, to reject all bids and, if so, to re-advertise or (by 4 affirmative votes of DISTRICT Board) to accomplish the work by District force

account and/or to buy the materials on the open market.

#### ADDENDA

All bidders shall promptly notify the District's Project Manager of any ambiguity, inconsistency or error that they may discover upon examination of the bidding documents. Bidders requiring clarification or interpretation of the bid documents shall make a written request (email acceptable) which shall reach the Project Manager by close of business on **Friday, August 29, 2014**. Any interpretation, correction or change of the bidding documents will be made by addendum issued by the General Manager. Interpretations of, corrections to, or changes in the bidding documents made in any other manner will not be binding, and bidders shall not rely upon such interpretations, corrections and changes. Addenda will be mailed or delivered to all that are known by the General Manager to have received a complete set of bidding documents. Copies of addenda will be made available for inspection wherever bid documents are on file for that purpose. No addenda will be issued later than four working days prior to the date for receipt of bids, except for an addendum withdrawing the request for bids or one that includes postponement of the date for receipt of bids. Each bidder shall be responsible for ascertaining prior to submitting a bid that he has received all addenda issued. Each bidder shall sign and submit all required addenda in order to receive award consideration.

#### SUBSTITUTE OR 'OR EQUAL' ITEMS

The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in the General Conditions, or those substitute materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function, and quality to be met by any proposed substitute or "or-equal" item. Request for Engineer's clarification of materials and equipment considered "or-equal" prior to the Effective Date of the Agreement must be received by the Engineer at least 10 days prior to the date for receipt of Bids. No item of material or equipment will be considered by Engineer as a substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

#### SALES AND USE TAXES

Contractor shall pay all sales, use, and other taxes as specified in Paragraph 6.10 of the General Conditions.

#### PROTEST

Any directly affected party who is aggrieved in connection with the solicitation or award of a contract issued by the District through a formal sealed bid procedure may protest the procurement action taken by filing a protest in writing with the General Manager within five (5) working days from the time of the occurrence generating the protest. Protests received after this time will not be considered. Any protest shall include the following information: date and action taken resulting in a protest; identification of the material issue, including a detailed explanation of the basis for the protest, and the remedy sought; if the protest relates to specification, provision of supporting technical data test results, or other pertinent information, showing that the substitute offered is equal to or better than the specification requirement.

Upon receipt of a protest, the General Manager will convene, at his earliest possible convenience, discussions with the protesting party to seek informal resolution and/or to clarify the issues, but that if the protest is not resolved by mutual agreement, the General Manager shall provide a written response to the protesting party within fifteen (15) working days following the informal meeting stating the General Manager's decision, the facts supporting the decision, and informing the protesting party of its right to appeal the decision to the Board of Directors.

If the informal resolution procedure is unsuccessful, the protesting party may request an appeal hearing before the Board of Directors by filing a written request with the District Secretary no later than five (5) working days after notification of the General Manager's decision; that any appeal hearing shall be scheduled within thirty (30) working days, or the next regularly scheduled meeting after thirty (30) working days, from the date request is received by the District Secretary; that the District

Secretary shall notify the appellant by personal service or registered mail of the scheduled hearing date not less than ten (10) working days from the date of hearing; that the appellant shall have the right to testify at the hearing, to be represented by counsel, to present witnesses on his behalf, and to present oral and written documents and evidence on the issue; and that after the conclusion of the hearing, the Board of Directors shall make findings of fact and a final decision concerning the issue(s).

#### SUBCONTRACTORS, SUPPLIERS, AND OTHERS

If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to DISTRICT in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to DISTRICT a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by DISTRICT. If DISTRICT or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, DISTRICT may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

If apparent Successful Bidder declines to make any such substitution, DISTRICT may award the Contract to the next lowest responsible Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which DISTRICT and Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to DISTRICT and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.

Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in paragraph 6.06 of the General Conditions.

#### EVALUATION OF BIDS AND AWARD OF CONTRACT

DISTRICT reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. DISTRICT further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. DISTRICT also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

In evaluating Bids, DISTRICT will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

In evaluating Bidders, DISTRICT will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

DISTRICT may conduct such investigations as DISTRICT deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the contract Documents.

If the Contract is to be awarded, DISTRICT will award the Contract to the responsible Bidder whose Bid, conforming with all the material terms and conditions of the Instructions to Bidders, is lowest, price and other factors considered. If detailed in the bid form, factors such as discounts, transportation costs, and life cycle costs may be used to determine which bidder, if any, is to offer the award.

IDENTICAL BIDS

Pursuant to Government Code §53064, if there are two or more identical lowest responsible and responsive bids for the awarding of a contract hereby, the Board may draw lots to determine which bid shall be accepted or may make the award to that identical bidder who is located within the jurisdiction of the District, if the other identical bidder(s) are not so located.

**Requests shall be directed to:**

NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT  
1195 Third Street, Second Floor  
Napa, California 94559

Plans & Specs:

Frye's Printing, 1050 Lincoln Avenue, Napa, Calif 94558. Phone (707) 253-1114. Documents may also be downloaded at <http://www.napaoutdoors.org/documents/camp-berryessa-bid>.

For questions, contact Chris Cahill, Project Manager, at the above-stated mailing address, [ccahill@ncrposd.org](mailto:ccahill@ncrposd.org), or 707.299.1335. Formal requests for clarification shall be in writing only.

**AWARD AND EXECUTION**

The DISTRICT affirms that in any contract entered into pursuant to this advertisement, disadvantaged business enterprise will be afforded full opportunity to submit bids in response to this invitation.

The CONTRACTOR shall execute required documents within seven (7) calendar days after Notice of Award; shall commence construction within fifteen (15) calendar days after the Notice to Proceed; and shall complete all the work and improvements by December 1, 2014.

The DISTRICT reserves the right to reject any and all proposals and to waive any irregularities. No Bidder may withdraw their Contract Proposal for a period of sixty (60) days after the bid opening. Copies of the CONTRACT DOCUMENTS may be examined or obtained at the address(es) stated herein.

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

**THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT**

\_\_\_\_\_  
John Woodbury  
its General Manager



THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

**CONTRACT PROPOSAL**  
*for the*  
**Camp Berryessa Improvement Project**

Name of Bidder \_\_\_\_\_

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

Telephone # \_\_\_\_\_ Email \_\_\_\_\_ FAX # \_\_\_\_\_

TO THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT:

Pursuant to and in compliance with the Notice Inviting Bids and other CONTRACT DOCUMENTS relating thereto, the undersigned Bidder, being fully familiar with the terms of the CONTRACT DOCUMENTS, local conditions affecting the performance of the Agreement, the character, quality, quantities and scope of the work, and the cost of the work at the place of performance, hereby proposes and agrees, within the time stipulated in the CONTRACT DOCUMENTS, to furnish to DISTRICT all transportation, materials, equipment, labor, services, permits, utilities, and all other items necessary to conduct and complete said work, all in strict conformity with the CONTRACT DOCUMENTS, including Addenda Nos.

\_\_\_\_\_, for the **total sum of** \_\_\_\_\_ **Dollars**

(\$ \_\_\_\_\_), which is in agreement to the unit prices set in the Bid Schedule.

Bidder declares that the only persons or parties interested in this proposal, as principals, are those named herein, and that this proposal is made without collusion with any person, firm or corporation. Bidder proposes and agrees, if the proposal is accepted, that Bidder will execute a contract with the DISTRICT, in the form set forth in the CONTRACT DOCUMENTS, and will perform the entire work for the prices set forth in the attached Bid Schedule, upon which the award of contract is made.

The Prime CONTRACTOR shall perform at least fifty-five (55) percent of the Contract bid amount. This portion of work shall encompass the performance of work by the Prime CONTRACTOR's forces and equipment and the procurement of materials and equipment by the Prime CONTRACTOR.

As required by § 4100-4107 of the California Government Code, the General CONTRACTOR bidding will hereinafter state the subcontractor for each particular trade or subdivision of the work, and will state the firm name and principal location of the mill, shop or office of each:

**DIVISION OF  
WORK OR TRADE**

**NAME OF  
FIRM OR SUBCONTRACTOR**

**LOCATION OF MILL,  
SHOP, OR OFFICE**

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**DIVISION OF  
WORK OR TRADE**

**NAME OF  
FIRM OR SUBCONTRACTOR**

**LOCATION OF MILL,  
SHOP, OR OFFICE**

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ACCOMPANYING THIS CONTRACT PROPOSAL is \_\_\_\_\_ (Insert the words "cash," "Bidder's Bond," "Cashier's Check" or "Certified Check") in an amount equal to at least ten percent (10%) of the Total Bid Amount of \$\_\_\_\_\_ shown on the Bid Schedule, payable to the NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT.

The undersigned deposits the above-named security as a proposal guarantee, and agrees that it shall be forfeited to the DISTRICT as liquidated damages in case this proposal is accepted by the DISTRICT and the undersigned fails to execute a contract with the DISTRICT as specified in the CONTRACT DOCUMENTS, or fails to furnish required payment and performance bonds, or insurance certificates as specified in the CONTRACT DOCUMENTS. In addition, should the DISTRICT be required to engage the services of an attorney in connection with the enforcement of this Contract Proposal, Bidder promises to pay the DISTRICT's reasonable attorney's fees incurred, with or without suit.

The names of all persons interested in the foregoing proposals as principals are as follows:

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**NOTICE:** *If Bidder or other interested person is a corporation, state the legal name of corporation, also the names of the president, secretary, treasurer, and manager thereof; if a general partnership, state true name of the firm, also the names of all individual partners composing the firm; if a limited partnership, state the names of all general partners and limited partners; if Bidder or other interested person is an individual, state first and last names in full.*

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**LICENSE**

The Bidder is licensed in accordance with the California State CONTRACTOR's License Law. CONTRACTOR shall possess a California Class A General Engineering Contractors License at the time of bidding and shall be skilled and regularly engaged in the general class or type of work called for under the Contract to bid this Project.

CONTRACTOR's License No.:

Name (typed)\*: \_\_\_\_\_

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

Telephone Number: \_\_\_\_\_ Dated: \_\_\_\_\_

Signature of Bidder: \_\_\_\_\_

**\*NOTE:** *If Bidder 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 and the corporate seal; if Bidder is a 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 partnership, and if the Bidder is an individual, the signature shall be placed above.*

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Napa County Regional Park and Open Space District  
Camp Berryessa Improvement Project

**Contract Bid Sheet**

The following quantities are approximate only and are given for the purpose of comparing proposals. The DISTRICT does not expressly or by implication agree that the actual amount of work will correspond with quantities given herein, but reserves the right to increase or decrease the amount of any class or portion of the work as may be deemed necessary or advisable by the Project Engineer. Payment will be based upon the actual quantities installed or constructed, unless otherwise specified. **Note:** Permits for this work to be secured by DISTRICT.

Division		Demolition and Soil Import	Trails and Welcome Center	Amphitheater	Entrance Road, Parking, and ADA Parking	Camp Host, and Recycling Center	Water System	Graywater and SDI	Tent Cabins and Activity Centers	Combination Shower/Bathroom Building	Small Boat Boarding Dock	Electrical	TOTALS
1	General Requirements												
2	Site Work												
3	Concrete												
4	Masonry												
5	Miscellaneous Metals												
6	Wood and Plastics												
7	Thermal & Moisture Protection												
8	Doors & Windows												
9	Finishes												
10	Specialities												
11	Equipment												
12	Furnishings												
13	Special Construction												
14	Conveying Systems												
15	Mechanical												
16	Electrical												
<b>Subtotal Net Construction</b>													

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**BID BOND**

We, \_\_\_\_\_ as Principal, and \_\_\_\_\_ as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors, and assigns, as set forth herein, to the Napa County Regional Park and Open Space District (herein called DISTRICT) for payment of the penal sum of Dollars (\$\_\_\_\_\_), lawful money of the United States. Principal has submitted the accompanying proposal for the construction of the:

**Camp Berryessa Improvement Project**

If the Principal is awarded the contract and enters into a written agreement, in the form prescribed by the CONTRACT DOCUMENTS, at the price designated by the CONTRACT PROPOSAL, and files two bonds with the DISTRICT, one to guarantee payment for labor and materials and the other to guarantee faithful performance, in the time and manner specified by the CONTRACT DOCUMENTS, and carries all insurance in type and amount which conforms to the CONTRACT DOCUMENTS and furnishes required certificates thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect. Forfeiture of this bond, or any deposit made in lieu thereof, shall not preclude the DISTRICT from seeking all other remedies provided by law to cover losses sustained as a result of the Principal's failure to do any of the foregoing.

It is further agreed that if the DISTRICT is required to engage the services of an attorney in connection with the enforcement of this bond, Principal and Surety shall pay DISTRICT's reasonable attorney's fees incurred, with or without suit.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 2014

By \_\_\_\_\_  
(authorized representative of principal)

Title \_\_\_\_\_  
(attach acknowledgement of authorized representative of principal)

By \_\_\_\_\_  
(authorized representative of surety)

Title \_\_\_\_\_  
(attach acknowledgment of authorized representative of surety)

(Seal if Corporation)

**Any claims under this bond may be addressed to:**

Surety's agent for service  
of process in California:

\_\_\_\_\_  
Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
City and State

\_\_\_\_\_  
Phone

Surety Company:

\_\_\_\_\_  
Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
City and State

\_\_\_\_\_  
Phone

By:

\_\_\_\_\_  
*(attorney in fact or other representative)*  
(attach acknowledgement)

Sureties must be authorized to do business in, and have an agent for service of process in California, and be on the accredited list of the United States Treasury Department, and their bonds will be limited to such amounts as would be acceptable to the Treasury Department. The name, address, and phone number of the Company as well as the Agent shall be attached hereto.

**Notice: No substitution or revision to this bond form will be accepted.**



**NON-COLLUSION AFFADAVIT**

**AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID**

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

\_\_\_\_\_, being first duly sworn, deposes and says  
(name)  
that he or she is \_\_\_\_\_ of  
(position title)

\_\_\_\_\_  
(the bidder)

the party making the foregoing bid; that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false 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.

DATED: \_\_\_\_\_ By \_\_\_\_\_  
(person signing for bidder)

Subscribed and sworn to before me on:

\_\_\_\_\_

\_\_\_\_\_  
(notary public)

(notarial seal)

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THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA



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# CONSTRUCTION CONTRACTOR'S QUALIFICATION STATEMENT FOR ENGINEERED CONSTRUCTION

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This qualification statement was developed by AGC of America in cooperation with the Engineers Joint Contract Documents Committee (EJCDC) which recommend its use as a suggested generic prequalification statement or a contract-specific qualification statement. In the latter case, the owner or engineer may wish to make appropriate supplemental inquires.

The Engineers Joint Contract Documents Committee consists of representatives of the following organizations:

- National Society of Professional Engineers
- American Consulting Engineers Council
- American Society of Civil Engineers
- Construction Specifications Institute

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**The contents of this statement are CONFIDENTIAL.**

**Submitted by:**

Name of Organization \_\_\_\_\_

Name of Individual \_\_\_\_\_

Title \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_

**Submitted to:**

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_

Project Name and Description (if applicable)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Contractor's General Business Information**

Check If:

Corporation  Partnership  Joint Venture  Sole Proprietorship

**If Corporation:**

a. Date and State of Incorporation

\_\_\_\_\_

\_\_\_\_\_

b. List of Executive Officers

Name

Title

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**If Partnership:**

a. Date and State of Organization

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b. Names of Current General Partners

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c. Type of Partnership

General    Publicly Traded

Limited    Other (describe): \_\_\_\_\_

**If Joint Venture:**

a. Date and State of Organization

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b. Name, Address and Form of Organization *of* Joint Venture Partners: (Indicate managing partner by an asterisk \*)

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**If Sole Proprietorship:**

a. Date and State of Organization

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b. Name and Address of Owner or Owners

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1. On Schedule A, attached, list major engineered construction projects completed by this organization in the past five (5) years. (If joint venture, list each participant's projects separately).
2. On Schedule B, attached, list current projects under construction by this organization. (If joint venture, list each participant's projects separately).
3. Name of surety company and name, address, and phone number of agent.

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4. Is your organization a member of a controlled group of corporations as defined in I.R.C. Sec. 1563?  
 Yes  No

If yes, show names and addresses of affiliated companies.

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5. Furnish on Schedule C, attached, details of the construction experience of the principal individuals of your organization directly involved in construction operations.

6. Has your organization ever failed to complete any construction contract awarded to it?  Yes  No

If yes, describe circumstances on attachment.

7. Has any Corporate officer, partner, joint venture participant or proprietor ever failed to complete a construction contract awarded to him or her in their own name or when acting as a principal of another organization?  
 Yes  No

If yes, describe circumstances on attachment.

8. In the last five years, has your organization ever failed to substantially complete a project in a timely manner?  
 Yes  No

If yes, describe circumstances on attachment.

9. Indicate general types of work performed with your own work force.

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10. If required, can your organization provide a bid bond for this project?  Yes  No

11. What is your approximate total bonding capacity?

\$500,000 to \$2,000,000

\$2,000,000 to \$5,000,000

\$5,000,000 to \$10,000,000

\$10,000,000 or more

12. Describe the permanent safety program you maintain within your organization. Use attachment if necessary.

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13. Furnish the following information with respect to an accredited banking institution familiar with your organization.

Name of Bank \_\_\_\_\_

Address \_\_\_\_\_

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Account Manager \_\_\_\_\_

Telephone \_\_\_\_\_

I hereby certify that the information submitted herewith, including any attachment is true to the best of my knowledge and belief.

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

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

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

**SCHEDULE A**

Name, Location and  
Description of Project

Owner

Design Engineer

Date Completed

Contract Price

Reference/Contact  
Include Address and Phone

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**SCHEDULE B**

Name, Location and  
Description of Project

Owner

Design Engineer

Contract Price

Amount  
Completed

Date of Scheduled  
Completion

Reference/Contact  
Include Address and Phone

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**SCHEDULE C - PERSONNEL**

<u>Name</u>	<u>Position</u>	<u>Date started with this organization</u>	<u>Date started in construction</u>	<u>Prior positions and experience in construction</u>
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**CONTRACT FOR CONSTRUCTION**

*for the*

**Camp Berryessa Improvement Project**

**THIS AGREEMENT**, entered into this \_\_\_\_\_ day of \_\_\_\_\_, 2014 by and between the NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT, a special district organized under the laws of the State of California, hereinafter referred to as "DISTRICT", and \_\_\_\_\_ a (state entity type) \_\_\_\_\_, hereinafter referred to as "CONTRACTOR";

**TERMS**

**ARTICLE I.** In consideration of the payments and covenants hereinafter mentioned, to be made and performed by DISTRICT, and under the conditions expressed in the Labor and Materials bond attached hereto, CONTRACTOR shall, at CONTRACTOR's own cost and expense, do all the work and furnish all materials, except such as are specified herein to be furnished by DISTRICT, necessary to construct and complete in a good, workmanlike and substantial manner and to the satisfaction of DISTRICT that project known as "**the Camp Berryessa Improvement Project**" which shall be constructed in the County of Napa, California, in accordance with the Plans and Specifications ("Plans") attached hereto as Exhibit A, the Bid submitted by CONTRACTOR ("Bid Proposal") attached hereto as Exhibit B, and the 2006 Standard Specifications of the State of California Department of Transportation ("Standard Specifications"). The Plans, Bid Proposal, and Standard Specifications are hereby incorporated by reference as if set forth herein.

**ARTICLE II.** DISTRICT hereby promises and agrees with CONTRACTOR to employ, and does hereby employ, CONTRACTOR to provide the materials and to do the work according to the terms and conditions herein contained for the prices hereinafter set forth, and hereby contracts to pay the same at the time, in the manner, and upon the conditions set forth herein, and both parties hereby agree, for themselves, their heirs, executors, administrators, successors and assigns, to full performance of the covenants contained herein.

**ARTICLE III.** It is further expressly agreed by and between the parties that if there is any conflict between the Bid Proposal of CONTRACTOR and any of the other terms of this Contract, then such other terms shall control and any such conflicting terms of the Bid Proposal shall not be deemed to have been accepted by DISTRICT.

**ARTICLE IV.** CONTRACTOR agrees to receive and accept the following prices as full compensation for furnishing all materials and for doing all the work contemplated and embraced in this Contract; for all loss and damage, arising out of the nature of such work, from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered in the prosecution of the work until its acceptance by the DISTRICT and for all risks of every description connected with the work; for all expenses incurred by or in consequence of the suspension or discontinuance of work; and for well and faithfully completing the work and the whole thereof in the manner and according to the Plans and Specifications (both standard and project specific) and the requirements of DISTRICT under them.

**IN WITNESS WHEREOF**, this Contract has been approved by DISTRICT and CONTRACTOR as of the date first set forth in this Contract.

Napa County Regional Park and Open Space District,  
a California Special District

By \_\_\_\_\_  
John Woodbury, General Manager

“DISTRICT”

ATTEST:  
District Secretary

By \_\_\_\_\_  
Melissa Frost

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

By \_\_\_\_\_  
Name of Officer:

By \_\_\_\_\_  
Name of Officer:

“CONTRACTOR”

APPROVED AS TO FORM:  
District Legal Counsel

\_\_\_\_\_

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

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

**PERFORMANCE BOND**

**KNOW ALL PERSONS BY THESE PRESENTS THAT WE,** \_\_\_\_\_ whose address is \_\_\_\_\_, as Principal, and \_\_\_\_\_, duly authorized under the laws of the State of California to become sole surety on bonds and undertakings, as Surety, are jointly and severally held and firmly bound unto the NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT, a California special district organized under the laws of the State of California, as Obligee, in the full and just sum of \_\_\_\_\_ lawful money of the United States of America, to be paid to the said Obligee, successors or assigns; for which payment, well and truly to be made, we bind ourselves, our heirs, executors, successors, administrators and assigns, jointly and severally, firmly by these presents.

**THE CONDITION** of the foregoing obligation is such that; whereas, the above bounden Principal has entered into a contract, or is about to enter into a contract with the Obligee to do and perform the following work, to-wit: **“the Camp Berryessa Improvement Project”** as is more specifically set forth in said contract, to which contract reference is hereby made.

**NOW, THEREFORE,** if the said Principal shall well and truly do the said work, and fulfill each and every of the covenants, conditions and requirements of the said contract in accordance with the plans and specifications, then the above obligation shall be null and void, otherwise it shall remain in full force and effect.

**THE SURETY** does hereby consent to any and all alterations, modifications and revisions to the agreement secured by this bond including but not limited to, any extension of time for performance or modifications in manner of performance which may be agreed upon and between the NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT, as Obligee and the Principal, and the Surety does hereby waive notice of any alterations, modifications, revisions, or extensions.

**SEALED** with our seals and dated this \_\_\_\_\_ day of \_\_\_\_\_, 2014.

Principal  
(CONTRACTOR): \_\_\_\_\_

Surety: \_\_\_\_\_

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

By: \_\_\_\_\_, Attorney in Fact

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

*Signatures for Principal and Surety must be acknowledged before Notary Public*

APPROVED AS TO FORM: Legal Counsel  
The Napa County Regional Park and Open Space District

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

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**LABOR AND MATERIAL BOND**

**KNOW ALL PERSONS BY THESE PRESENTS THAT WE,** \_\_\_\_\_ as Principal,  
and \_\_\_\_\_

\_\_\_\_\_ duly authorized under the laws of the State of California to become sole surety on bonds and undertakings, as Surety, are held and firmly bound unto any and all material men, persons, companies or corporations furnishing materials, provisions, provender or other supplies used in, upon, for or about the performance of the work contracted to be executed or performed under the contract hereinafter mentioned, and all persons, companies or corporations renting or hiring teams, or implements or machinery, for or contributing to said work to be done, and all persons who performed work or labor upon the same, and whose claim has not been paid by the CONTRACTOR, company or corporation, in the just and full sum of:

\_\_\_\_\_, for the payment whereof, well and truly to be made, said Principal and Surety bind themselves, their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

**THE CONDITION** of the foregoing obligation is such that; whereas the above bounden principal has entered into a contract, or is about to enter into a contract with the NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT, a special district organized under the laws of the State of California, to do and perform the following work, to-wit: **the Camp Berryessa Improvement Project.**

**NOW THEREFORE,** if the above bounden principal, contractor, person, company or corporation, or his/her or its subcontractor fails to pay for any materials, provisions, provender, other supplies, or terms used in, upon for or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal or the subcontractors of the Principal pursuant to §13020 of the Unemployment Insurance Code with respect to the work and labor, then the Surety of this bond will pay the same, in an amount not exceeding the sum specified in this bond as well as a reasonable attorney's fee, which shall be fixed and awarded by the court to the prevailing party in said suit, said attorney's fee to be taxed as costs in said suit and to be included in the judgment therein rendered.

**THE SURETY** does hereby consent to any and all alterations, modifications and revisions to the contract above referred to, and work and labor under which is secured by this bond, including but not limited to, any extension of time for performance or modifications in manner of performance which may be agreed upon by and between the NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT and the Principal, and the Surety does hereby waive notice of any alterations, modifications, revisions, or extensions.

**THIS BOND** is executed and filed to comply with the provisions of the act of Legislature of the State of California as designated in Civil Code §§3247-3251, inclusive, and all amendments thereto and shall inure to the benefit of any of the persons named in Civil Code §3181 so as to give a right of action to those person or their assigns in any suit brought upon the bond.

SEALED with our seals and dated this \_\_\_\_\_ day of \_\_\_\_\_, 2014

Principal  
(CONTRACTOR): \_\_\_\_\_

Surety: \_\_\_\_\_

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

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

.Attorney in Fact

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

Signatures for Principal and Surety must be acknowledged before Notary Public

APPROVED AS TO FORM: Legal Counsel of the  
NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

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



# THE NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

## Camp Berryessa Improvement Project

### EXHIBIT A Plans and Specifications

#### District General Requirements

##### 1. LOCATION

The work is located at 7900 Berryessa-Knoxville Road, Napa, Calif. 94558

##### 2. CONTRACT DOCUMENTS

The Contract Documents shall include the Standard Specifications of the State of California, Department of Transportation, dated May 2006, insofar as same may apply, these District General Requirements, the General and Special Provisions included in the "Contract Documents" prepared by PSOMAS, the Notice to Contractors, the Proposal, the two contract bonds required herein, any supplemental agreements amending or extending the work, and pertinent portions of other documents included by reference thereto in the District General Requirements, the General and Special Provisions, or the Contract pages. To the extent that anything in these District General Requirements may conflict with any other portion of the contract or contract documents, these District General Requirements shall supersede and control.

##### 3. TIME OF COMMENCEMENT AND OF COMPLETION

The CONTRACTOR shall accept the contract and execute required documents within seven (7) calendar days after Notice of Award; shall commence construction within fifteen (15) calendar days after the Notice to Proceed; and shall diligently prosecute the same to completion such that all work and improvements are completed by December 1, 2014.

##### 4. PREVAILING WAGES

In accordance with the provisions of Section 1774 of the Labor Code of the State of California, the General Manager of the DISTRICT has ascertained from the Director of Industrial Relations the general prevailing rate of wages (which rate includes employer payments for health and welfare, pension, vacation and similar purposes) applicable to the work to be done. These rates of wages are available on the internet at <http://www.dir.ca.gov/OPRL/PWD/index.htm> or they may be inspected at the Offices of the Napa County Regional Park and Open Space District, 1125 Third Street, Second Floor, Napa, California (please call 707-299-1335 to schedule an appointment).

##### 5. PAYROLL RECORDS

Special Attention is directed to the provisions of Section 7-1.01A(3) of the Standard Specifications. A copy of all payrolls shall be submitted weekly to the Labor Compliance Manager. Payrolls shall contain the full name, address and social security number of each employee, his/her correct classification, rate of pay, daily and weekly number of hours worked, itemized deductions made and actual wages paid. They shall also indicate apprentices and ratio of apprentices to journeymen. The employee's address and social security number need only appear on the first payroll on which his/her name appears. The payroll shall be accompanied by a "Statement of Compliance" signed by the employer or his/her agent indicating that the payrolls are correct and complete and that the wage rates contained therein are not less than those required by the contract. The "Statement of Compliance" shall be on forms furnished by the Project Engineer or on any form with identical wording. The CONTRACTOR shall be responsible for the submission of copies of payrolls of all subcontractors.

##### 6. PROPOSAL REQUIREMENTS AND CONDITIONS

(a) Examination of Site. Each bidder shall have examined the site of the work before bidding so s/he shall have full knowledge of all facilities and difficulties affecting the work which may not be particularly described herein. No variation or allowance from the contract sum will be made because of lack of such examination or knowledge.

(b) State Contract Act. The State Contract Act is not applicable to this Contract. Pre-qualification of bidders will not be required.

## 7. SCOPE OF WORK

The intent of the Plans and Specifications is to cover the complete project. The CONTRACTOR shall accomplish complete installation and construction of the Camp Berryessa Improvements. The quantities and items listed in the proposal form and contract form are given as a basis for the comparison of bids and the DISTRICT does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of the work as may be deemed necessary or expedient by the Project Engineer.

Increases and decreases in the quantity of a contract item of work shall be addressed per Section 4-1.03B of the Standard Specifications, except that any increase in excess of 25% shall be authorized only if approved by the DISTRICT Board of Directors at the earliest meeting of the Board following the request for said increase.

## 8. CONTROL OF THE WORK

Deviations from the approved Plans and Specifications shall be approved by the Project Engineer and all such changes shall be by written permission only.

## 9. LEGAL RELATION AND RESPONSIBILITY

Attention is directed to Section 7 of the Standard Specifications.

(a) Prevailing Wages. In-lieu of the prevailing wage rates being set forth in the Notice to Contractors as provided in Standard Specifications Section 7-1.01 A(2) "Prevailing Wages", see Section 4 of these District General Requirements.

(b) Public Safety. Furnishing and maintenance of barricades, flashing lights and other safety devices shall be the responsibility of the CONTRACTOR at all times. The CONTRACTOR shall respond promptly to correct improper conditions or inoperative devices.

Failure to frequently inspect and maintain lights and barricades in proper operating condition when in use on the roadway, or failure to respond promptly to notification of improperly operating equipment, will be sufficient cause for suspension of the contract until such defects are corrected.

All expenses incurred by DISTRICT because of emergency "call-outs" and for resetting or supplementing the CONTRACTOR's barricades or warning devices, will be charged to the CONTRACTOR and may be deducted from moneys due him.

(c) Acceptance of Contract. Attention is directed to Section 7-1.17 of the Standard Specifications. Acceptance will consist of the execution and filing with the County Recorder of a Notice of Completion as defined in Civil Code section 3093.

Should it become necessary due to developed conditions to occupy any portion of the work before the contract work is fully completed, such occupancy shall not constitute acceptance.

(d) Hold Harmless/Indemnification. To the full extent permitted by law, CONTRACTOR shall hold harmless, defend at its own expense, and indemnify DISTRICT and its officers, agents, employees and volunteers from any and all liability, claims, losses, damages or expenses, including reasonable attorney's fees, for personal injury (including death) or damage to property, arising from all acts or omissions to act of CONTRACTOR or its officers, agents, employees, volunteers, contractors and subcontractors in rendering services under this Contract, excluding, however, such liability, claims, losses, damages or expenses arising from the sole negligence or willful acts of DISTRICT or its officers, agents, employees or volunteers. Each party shall notify the other party immediately in writing of any claim or damage related to activities performed under this Contract. The parties shall cooperate with each other in the investigation and

disposition of any claim arising out of the activities under this Contract, providing that nothing shall require either party to disclose any documents, records or communications that are protected under peer review privilege, attorney-client privilege, or attorney work product privilege.

(e) Insurance. CONTRACTOR shall obtain and maintain in full force and effect throughout the term of this Contract, and thereafter as to matters occurring during the term of this Contract, the following insurance coverage:

(1) Workers' Compensation insurance. To the extent required by law during the term of this Contract, CONTRACTOR shall provide workers' compensation insurance for the performance of any of CONTRACTOR's duties under this Contract; including but not limited to, coverage for workers' compensation and disability, and shall provide DISTRICT with certification of all such coverages upon request by DISTRICT's Risk Manager.

(2) Liability insurance. CONTRACTOR shall obtain and maintain in full force and effect during the term of this Contract the following liability insurance coverages, issued by a company licensed (admitted) to transact business in the State of California and/or having a A.M. Best rating of A VII or better:

(i) General Liability. Commercial or comprehensive general liability [CGL] insurance coverage (personal injury and property damage) of not less than TWO MILLION DOLLARS (\$2,000,000) combined single limit per occurrence, covering liability or claims for any personal injury, including death, to any person and/or damage to the property of any person arising from the acts or omissions of CONTRACTOR or any officer, agent, or employee of CONTRACTOR under this Contract.

(ii) Comprehensive Automobile Liability Insurance. Comprehensive automobile liability insurance (Bodily Injury and Property Damage) on owned, hired, leased and non-owned vehicles used in conjunction with CONTRACTOR's business under this Contract of not less than THREE HUNDRED THOUSAND DOLLARS (\$300,000) combined single limit per occurrence.

(3) Certificates. All insurance coverages referenced in (2), above, shall be evidenced by one or more certificates of coverage which shall be filed by CONTRACTOR with the Project Engineer prior to commencement of performance of any of CONTRACTOR's duties; shall be kept current during the term of this Contract; shall provide that DISTRICT through the Project Engineer shall be given no less than thirty (30) days prior written notice of any non-renewal, cancellation, other termination, or material change, except that only ten (10) days prior written notice shall be required where the cause of non-renewal or cancellation is non-payment of premium; and shall provide that the inclusion of more than one insured shall not operate to impair the rights of one insured against another insured, the coverage afforded applying as though separate policies had been issued to each insured, but the inclusion of more than one insured shall not operate to increase the limits of the company's liability. For the insurance coverage referenced in (2)(i), the certificate of insurance or endorsements attached thereto shall also name the DISTRICT and its officers, employees, agents and volunteers as additional insureds; that if the same policy applies to activities of CONTRACTOR not covered by this Contract then the limits in the applicable certificate relating to the additional insured coverage of DISTRICT shall pertain only to liability for activities of CONTRACTOR under this Contract; and shall provide that the insurance provided is primary coverage to DISTRICT with respect to any insurance or self-insurance programs maintained by DISTRICT. The additional insured endorsements for the general liability coverage shall use Insurance Services Office (ISO) Form No. CG 20 09 11 85 or CG 20 10 11 85, or equivalent, including (if used together) CG 2010 10 01 and CG 2037 10 01; but shall not use the following forms: CG 2010 10 93 or 03 94. Upon request by the Project Engineer, CONTRACTOR shall provide or arrange for the insurer to provide within thirty (30) days of the request, certified copies of the actual insurance policies or relevant portions thereof.

(4) Deductibles/Retentions. Any deductibles or self-insured retentions shall be declared to, and be approved by, the Project Engineer, which approval shall not be denied unless the Project Engineer determines that the deductibles or self-insured retentions are unreasonably large in relation to compensation payable under this Contract and the risks of liability associated with the activities required of CONTRACTOR by this Agreement. At the option of and upon request by the Project Engineer, either the insurer shall reduce or eliminate such deductibles or self-insurance retentions as respects DISTRICT or its officers, employees, agents and volunteers or CONTRACTOR shall procure a bond guaranteeing payment of losses and related investigations, claims administration, and defense expenses.

## 10. PROSECUTION AND PROGRESS

(a) Progress Schedule. The CONTRACTOR, promptly after being awarded the Contract, shall prepare and submit for the Project Engineer's information a CONTRACTOR's construction schedule for the work. The schedule shall not exceed the time

limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the work and project or when requested in writing by the Project Engineer, shall be related to the entire project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the work.

(b) Schedule of Submittals. The CONTRACTOR shall prepare and keep current, for the Project Engineer's approval, a schedule of submittals which is coordinated with the CONTRACTOR's construction schedule and allows the Project Engineer reasonable time to review submittals.

(c) Current Progress Schedule. The CONTRACTOR shall perform the work in general accordance with the most recent schedules submitted to the Project Engineer.

(d) Termination of Contract. In-lieu of the provisions of Section 8-1.08 of the Standard Specifications the following shall apply.

Whenever, in the opinion of the DISTRICT, the said work is neglected by the CONTRACTOR, or the same is not prosecuted with the diligence and force specified, meant and intended in and by the terms of this contract, it shall be lawful for the General Manager to make a requisition upon the CONTRACTOR for such additional specific force or such additional specific material to be brought into the work under this contract or to remove improper material from the grounds, and its due and faithful fulfillment requires; of which action of the General Manager due notice in writing of not less than five days shall be served upon the CONTRACTOR or his/her agent having charge of the work; and if the CONTRACTOR fails to comply with such requisition within five days, it shall be lawful for the General Manager to employ upon such work the additional force or supply the materials as specifically required as aforesaid; and the amount paid for such additional force or material shall be charged against the CONTRACTOR and be deducted from his/her next or subsequent estimate and payment, or the same or any part thereof not so deducted may be recovered from the CONTRACTOR or his/her sureties.

Moreover, if the CONTRACTOR fails to comply with such requisition within five days, the General Manager may declare the Contract terminated and may itself proceed to complete the work herein specified or may engage any other person or persons to do the same. Upon the completion of such work, the General Manager shall cause a statement to be made of the default of the CONTRACTOR as aforesaid and in completing the work itself or by any other person or persons. Should the amount in such statement be more than the amount would have been due the CONTRACTOR upon the completion of the work by him, the difference shall be paid by the CONTRACTOR to the DISTRICT.

## 11. MEASUREMENT AND PAYMENT

Attention is directed to Section 9 of the Standard Specifications.

(a) Force Account Payment. In-lieu of the first paragraph of Section 9-1.03A(3) "Equipment Rental", the following shall apply:

Equipment rental rates shall be those rental rates applicable on contracts advertised by the State of California, Department of Transportation on the date of call for bids on this contract.

(b) Partial payment. In-lieu of Section 9-1.06, Paragraph 3 of the Standard Specifications the DISTRICT will retain five percent (5%) of the value of all work done and five percent (5%) of the value of the materials so estimated to have been furnished and delivered and unused or furnished and stored as aforesaid as part security for the fulfillment of the contract by the CONTRACTOR to the extent not inconsistent with Public Contract Code Section 20104.50; all such retentions being subject to the following statutory requirements:

*Public Contract Code Section 7107. Retention proceeds; withholding disbursement*

*(a) This section is applicable with respect to all contracts entered into on or after January 1, 1993 relating to the construction of any public work of improvement.*

(b) The retention proceeds withheld from any payment by the public entity from the original CONTRACTOR, or by the original CONTRACTOR from any subcontractor, shall be subject to this section.

(c) Within 60 days after the date of completion of the work of improvement, the retention withheld by the public entity shall be released. In the event of a dispute between the public entity and the original CONTRACTOR, the public entity may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For purposes of this subdivision, "completion" means any of the following:

(1) The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup, or commissioning, by the public agency, or its agent, accompanied by cessation of labor on the work of improvement.

(2) The acceptance by the public agency, or its agent, of the work of improvement.

(3) After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 100 days or more, due to factors beyond the control of the CONTRACTOR.

(4) After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 30 days or more, if the public agency files for record a notice of cessation or a notice of completion.

(d) Subject to subdivision (e), within 10 days from the time that all or any portion of the retention proceeds are received by the original CONTRACTOR, the original CONTRACTOR shall pay each of its subcontractors from whom retention has been withheld, each subcontractor's share of the retention received. However, if a retention payment received by the original CONTRACTOR is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor, if the payment is consistent with the terms of the subcontract.

(e) The original CONTRACTOR may withhold from a subcontractor its portion of the retention proceeds if a bona fide dispute exists between the subcontractor and the original CONTRACTOR. The amount withheld from the retention payment shall not exceed 150 percent of the estimated value of the disputed amount.

(f) In the event that retention payments are not made within the time periods required by this section, the public entity or original CONTRACTOR withholding the unpaid amounts shall be subject to a charge of 2 percent per month on the improperly withheld amount, in lieu of any interest otherwise due. Additionally, in any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to attorney's fees and costs.

(g) If a state agency retains an amount greater than 125 percent of the estimated value of the work yet to be completed pursuant to Section 10261 of the Public Contract Code, the state agency shall distribute undisputed retention proceeds in accordance with subdivision (c). However, notwithstanding subdivision (c), if a state agency retains an amount equal to or less than 125 percent of the estimated value of the work yet to be completed, the state agency shall have 90 days in which to release undisputed retentions.

(h) Any attempted waiver of the provisions of this section shall be void as against the public policy of this state.

Public Contract Code Section 22300. Performance retentions; provision for substitute security; escrow agreement

(a) Provisions shall be included in any invitation for bid and in any contract documents to permit the substitution of securities for any moneys withheld by a public agency to ensure performance under a contract; however, substitution of securities provisions shall not be required in contracts in which there will be financing provided by the Farmers Home Administration of the United States Department of Agriculture pursuant to the Consolidated Farm and Rural Development Act (> 7 U.S.C. Sec. 1921 et seq.), and where federal regulations or policies, or both, do not allow the substitution of securities. At the request and expense of the CONTRACTOR, securities equivalent to the amount withheld shall be deposited with the public agency, or with a state or federally chartered bank in this state as the escrow agent, who shall then pay those moneys to the CONTRACTOR. Upon satisfactory completion of the contract, the securities shall be returned to the CONTRACTOR.

(b) Alternatively, the CONTRACTOR may request and the DISTRICT shall make payment of retentions earned directly to the escrow agent at the expense of the CONTRACTOR. At the expense of the CONTRACTOR, the CONTRACTOR may direct the investment of the payments into securities and the CONTRACTOR shall receive the interest earned on the investments upon the same terms provided for in this section for securities deposited by the CONTRACTOR. Upon satisfactory completion of the contract, the CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the DISTRICT, pursuant to the terms of this section.

*(c) Securities eligible for investment under this section shall include those listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the CONTRACTOR and the public agency. The CONTRACTOR shall be the beneficial owner of any securities substituted for moneys withheld and shall receive any interest thereon. Failure to include these provisions in bid and contract documents shall void any provisions for performance retentions in a public agency contract. For purposes of this section, the term "public agency" shall include, but shall not be limited to, chartered cities.*

*(d) (1) Any CONTRACTOR who elects to receive interest on moneys withheld in retention by a public agency shall, at the request of any subcontractor, make that option available to the subcontractor regarding any moneys withheld in retention by the CONTRACTOR from the subcontractor. If the CONTRACTOR elects to receive interest on any moneys withheld in retention by a public agency, then the subcontractor shall receive the identical rate of interest received by the CONTRACTOR on any retention moneys withheld from the subcontractor by the CONTRACTOR, less any actual pro rata costs associated with administering and calculating that interest. In the event that the interest rate is a fluctuating rate, the rate for the subcontractor shall be determined by calculating the interest rate paid during the time that retentions were withheld from the subcontractor. If the CONTRACTOR elects to substitute securities in lieu of retention, then, by mutual consent of the CONTRACTOR and subcontractor, the subcontractor may substitute securities in exchange for the release of moneys held in retention by the CONTRACTOR.*

*(2) This subdivision shall apply only to those subcontractors performing more than five percent of the CONTRACTOR's total bid.*

*(3) No CONTRACTOR shall require any subcontractor to waive any provision of this section.*

*(e) The Legislature hereby declares that the provisions of this section are of statewide concern and are necessary to encourage full participation by contractors and subcontractors in public contract procedures.*

*(f) The escrow agreement used hereunder shall be null, void, and unenforceable unless it is substantially similar to the following form:*

**ESCROW AGREEMENT FOR  
SECURITY DEPOSITS IN LIEU OF RETENTION**

This Escrow Agreement is made and entered into by and between:

\_\_\_\_\_ whose address is \_\_\_\_\_  
hereinafter called "DISTRICT," \_\_\_\_\_ whose address is \_\_\_\_\_  
hereinafter called " CONTRACTOR," and \_\_\_\_\_ whose address is \_\_\_\_\_  
\_\_\_\_\_ hereinafter called " Escrow Agent."

For the consideration hereinafter set forth, the DISTRICT, CONTRACTOR, and Escrow Agent agree as follows:

- (1) Pursuant to Section 22300 of the Public Contract Code of the State of California, CONTRACTOR has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by DISTRICT pursuant to the Construction Contract entered into between the DISTRICT and CONTRACTOR for \_\_\_\_\_ in the amount of \_\_\_\_\_ dated \_\_\_\_\_ (hereinafter referred to as the "Contract"). Alternatively, on written request of the CONTRACTOR, the DISTRICT shall make payments of the retention earnings directly to the Escrow Agent. When the CONTRACTOR deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the DISTRICT within 10 days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the DISTRICT and CONTRACTOR. Securities shall be held in the name of \_\_\_\_\_, and shall designate the CONTRACTOR as the beneficial owner.
- (2) The DISTRICT shall make progress payments to the CONTRACTOR for those funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.
- (3) When the DISTRICT makes payment of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of the CONTRACTOR until the time that the escrow created under this contract is terminated. The CONTRACTOR may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the DISTRICT pays the Escrow Agent directly.
- (4) CONTRACTOR shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the DISTRICT. These expenses and payment terms shall be determined by the DISTRICT, CONTRACTOR, and Escrow Agent.
- (5) The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of CONTRACTOR and shall be subject to withdrawal by CONTRACTOR at any time and from time to time without notice to the DISTRICT.
- (6) CONTRACTOR shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from the DISTRICT to the Escrow Agent that DISTRICT consents to the withdrawal of the amount sought to be withdrawn by CONTRACTOR.
- (7) The DISTRICT shall have a right to draw upon the securities in the event of default by the CONTRACTOR. Upon seven days' written notice to the Escrow Agent from the owner of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the DISTRICT.
- (8) Upon receipt of written notification from the DISTRICT certifying that the Contract is final and complete, and that the CONTRACTOR has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to CONTRACTOR all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.
- (9) Escrow Agent shall rely on the written notifications from the DISTRICT and the CONTRACTOR pursuant to Sections (5) to (8), inclusive, of this Agreement and the DISTRICT and CONTRACTOR shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.
- (10) The names of the persons who are authorized to give written notice or to receive written notice on behalf of the DISTRICT and on behalf of CONTRACTOR in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of DISTRICT:  
The NAPA COUNTY REGIONAL PARK  
AND OPEN SPACE DISTRICT

On behalf of CONTRACTOR:

John Woodbury  
General Manager

Title  
Name

\_\_\_\_\_  
*Signature*  
1195 Third Street, Second Floor  
NAPA, CALIFORNIA 94559

\_\_\_\_\_  
*Signature*  
Address:

On behalf of Escrow Agent:

\_\_\_\_\_  
Title  
\_\_\_\_\_  
Name  
\_\_\_\_\_  
Signature  
\_\_\_\_\_  
Address

At the time the Escrow Account is opened, the DISTRICT and CONTRACTOR shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

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

NAPA COUNTY REGIONAL PARK AND OPEN SPACE DISTRICT

***"DISTRICT"***

***"CONTRACTOR"***

By \_\_\_\_\_  
John Woodbury  
General Manager

By \_\_\_\_\_  
Name:  
Title:



Public Contract Code Section 20104.50 Timely progress payments; legislative intent; interest; payment requests

(a) (1) It is the intent of the Legislature in enacting this section to require all local governments to pay their contractors on time so that these contractors can meet their own obligations. In requiring prompt payment by all local governments, the Legislature hereby finds and declares that the prompt payment of outstanding receipts is not merely a municipal affair, but is, instead, a matter of statewide concern.

(2) It is the intent of the Legislature in enacting this article to fully occupy the field of public policy relating to the prompt payment of local governments' outstanding receipts. The Legislature finds and declares that all government officials, including those in local government, must set a standard of prompt payment that any business in the private sector which may contract for services should look towards for guidance.

(b) Any local agency which fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request from a CONTRACTOR on a construction contract shall pay interest to the CONTRACTOR equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

(c) Upon receipt of a payment request, each local agency shall act in accordance with both of the following:

(1) Each payment request shall be reviewed by the local agency as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request.

(2) Any payment request determined not to be a proper payment request suitable for payment shall be returned to the CONTRACTOR as soon as practicable, but not later than seven days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.

(d) The number of days available to a local agency to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which a local agency exceeds the seven-day return requirement set forth in paragraph (2) of subdivision (c).

(e) For purposes of this article:

(1) A "local agency" includes, but is not limited to, a city, including a charter city, a county, and a city and county, and is any public entity subject to this part.

(2) A "progress payment" includes all payments due contractors, except that portion of the final payment designated by the contract as retention earnings.

(3) A payment request shall be considered properly executed if funds are available for payment of the payment request, and payment is not delayed due to an audit inquiry by the financial officer of the local agency.

(f) Each local agency shall require that this article, or summary thereof, be set forth in the terms of any contract subject to this article.

(c) Claims. All claims under this contract shall be subject to the following statutory requirements:

Public Contract Code Section 20104 Application of article; provisions included in plans and specifications

(a) (1) This article applies to all public works claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between a CONTRACTOR and a local agency.

(2) This article shall not apply to any claims resulting from a contract between a CONTRACTOR and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

(b) (1) "Public work" has the same meaning as in Sections 3100 and 3106 of the Civil Code, except that "public work" does not include any work or improvement contracted for by the state or the Regents of the University of California.

(2) "Claim" means a separate demand by the CONTRACTOR for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the CONTRACTOR pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

(c) The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.

(d) This article applies only to contracts entered into on or after January 1, 1991.

Public Contract Code Section 20104.2 Claims; requirements, tort claims excluded

For any claim subject to this article, the following requirements apply:

- (a) 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 contract for the filing of claims.
- (b) (1) For claims of less than fifty thousand dollars (\$50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.
- (2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.
- (3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information whichever is greater.
- (c) (1) For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the local agency shall respond in writing to all written claim within 60 days of receipt of the claim, or may request in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.
- (2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.
- (3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation. or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.
- (d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency'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 local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.
- (e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.
- (f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by 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.

Public Contract Code Section 20104.4 Civil action procedures; mediation and arbitration: trial de novo: witness

The following procedures are established for all civil actions filed to resolve claims subject to this article:

- (a) Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties. The process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.
- (b) (1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of (Article 3 (commencing with Section 2016) of Chapter 3 of

*Title 3 Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.*

*(2) Notwithstanding any other provision of law, upon stipulation of parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.*

*(3) In addition to Chapter 2.5 (commencing with Section 1141.10) Title 3 of Part 3 of the Code of Civil Procedure, any party who receiving an arbitration award requests a trial de novo but does obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, pay the attorney's fees of the other arising out of the trial de novo.*

*(c) The court may, upon request by any party, order any witnesses participate in the mediation or arbitration process.*

*Public Contract Code Section 20104.6 Payment of portion of claim which is undisputed; of interest on arbitration award or judgment*

*(a) No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.*

*(b) In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.*

*(d) Final Payment. Payment will be made in accordance with the provisions of Section 9-1.07 of the Standard Specifications provided however that in no event will the final payment be made within 35 calendar days after the filing of Notice of Completion.*

*The final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the performance of the contract and the amount of work done thereunder and compensation therefore.*

## 12. MISCELLANEOUS PROVISIONS

(a) Licenses and Permits. Except as may be noted at "Works of Improvement," any and all licenses and permits required shall be provided by the CONTRACTOR at the CONTRACTOR's expense. The CONTRACTOR shall abide by any and all Federal, State, and County laws and rules affecting the work and shall maintain all required protection for property, employees and the public and insurance in connection with same, for all of which s/he shall bear necessary expense. The CONTRACTOR shall comply with all conditions and requirements of the Bay Area Air Quality Management District's Asbestos Dust Mitigation Permit/Plan, the Bureau of Reclamation's grading clearance, the County of Napa Building Permit, and the Regional Water Quality Control Board's Storm Water Pollution Prevention Plan/Permit, each of which is attached to this contract and/or incorporated by reference. The CONTRACTOR expressly acknowledges that the DISTRICT is subject to the building regulations of the County of Napa.

(b) Building Laws, etc. The CONTRACTOR shall conform to and abide by all County and State Building, Labor, Sanitary and Electrical Codes, Ordinances, Laws, Rules and Regulations. Such laws and regulations shall be considered a part of these Special Provisions as if set forth herein in full and the work and materials shall be in accordance therewith.

(c) Guarantees. All work performed and equipment or material furnished shall be guaranteed for one (1) year from date of acceptance against any inherent or developed defects of materials or workmanship in manufacture or installations.

All guarantees normally provided by manufacturers of equipment or material installed under this project shall be furnished to the DISTRICT and shall remain in force for their normal life.

(d) Ownership of Plans and Specifications. All drawings, specifications and copies thereof provided to the Bidder by the DISTRICT shall remain the property of the DISTRICT and they shall not be used by the CONTRACTOR or its subcontractors on other work.

(e) Addenda. Any addenda or notices issued during the time of bidding and forming a part of the documents provided to the Bidder for the preparation of his/her bid, shall be covered in the bid and shall be made a part of the contract. The Bidder shall acknowledge receipt of addenda in the space provided in the Proposal.

Should a bidder find apparent discrepancies in the drawings or documents, or should s/he be in any doubt as to their meaning, s/he should at once notify the Project Engineer, who will send a written instruction to all bidders. Neither the DISTRICT, the Board, nor the Project Engineer shall be responsible for oral instructions.

## 13. RIGHT TO DO WORK (NON-INTERFERENCE WITH EXISTING USES)

The DISTRICT as land manager and the United States Department of Interior as owner reserve the right to let other contracts in connection with this work, including any contracts necessary for construction of improvements described herein. The CONTRACTOR shall afford other contractors on the job site reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly connect and coordinate his/her work with theirs.

If any part of the CONTRACTOR's work depends for proper execution or results upon work of any other CONTRACTOR, the CONTRACTOR shall inspect and promptly report to the Project Engineer any defects in such work that render it unsuitable for proper execution and results. His/her failure to so inspect and report shall constitute his/her acceptance of other Contractors' work as fit and proper for reception of his/her work, except as to defects which may develop in other Contractors' work after execution of his/her work.

To insure proper execution of his/her subsequent work, the CONTRACTOR shall measure and inspect work already in place and shall at once report to the Project Engineer any discrepancy between executed work and contract documents.

The CONTRACTOR shall ascertain to his/her own satisfaction the scope of the project and nature of any other contracts that have been or may be awarded by DISTRICT in prosecution of the project to the end that the CONTRACTOR may perform this contract in the light of such other contracts, if any. Nothing herein contained shall be interpreted as granting to the

CONTRACTOR exclusive occupancy at the site of the project. The CONTRACTOR shall not cause any unnecessary hindrance or delay to any other Contractors working on project. If simultaneous execution of any contract for the project is likely to cause interference with performance of some other contract or contracts, the Project Engineer shall decide which CONTRACTOR shall cease work temporarily and which CONTRACTOR then shall continue or whether work can be coordinated so that the Contractors may proceed simultaneously.

#### 14. EQUAL OPPORTUNITY EMPLOYMENT

During the performance of the Contract, the CONTRACTOR shall comply with all applicable laws, ordinances, regulations, and codes, including but not limited to, the following:

(a) Non-Discrimination. During the performance of the work required by the Contract, the CONTRACTOR and its subcontractors shall not deny the benefits thereof to any person on the basis of sex, race, color, ancestry, religion or religious creed, national origin or ethnic group identification, sexual orientation, marital status, age (over 40), mental disability, physical disability or medical condition (including cancer, HIV and AIDS), nor shall they discriminate unlawfully against any employee or applicant for employment because of sex, race, color, ancestry, religion or religious creed, national origin or ethnic group identification, sexual orientation, marital status, age (over 40), mental disability, physical disability or medical condition (including cancer, HIV and AIDS), or use of family care leave. The CONTRACTOR shall ensure that the evaluation and treatment of employees and applicants for employment are free of such discrimination or harassment.

(b) Documentation of Right to Work. The CONTRACTOR shall abide by the requirements of the Immigration and Control Reform Act pertaining to assuring that all newly-hired employees of the CONTRACTOR performing any of the work under the Contract have a legal right to work in the United States of America, that all required documentation of such right to work is inspected, and that INS Form 1-9 (as it may be amended from time to time) is completed and on file for each employee. The CONTRACTOR shall make the required documentation available upon request to the Project Engineer for inspection.

(c) Inclusion in Subcontracts. To the extent any of the work to be performed by CONTRACTOR under the Contract is subcontracted to a third party, the CONTRACTOR shall include the provisions of (a) and (b), above, in all such subcontracts as obligations of the subcontractor.

#### 15. CONDITIONS BY CONTRACTOR

Before starting each portion of the work, the CONTRACTOR shall carefully study and compare the Contract Documents relative to that portion of the work, shall take field measurements of any existing conditions related to that portion of the work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the CONTRACTOR and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the CONTRACTOR shall be reported promptly to the Project Engineer as a request for information in such form as the Project Engineer may require.

Any design errors or omissions noted by the CONTRACTOR during this review shall be reported promptly to the Project Engineer, but it is recognized that the CONTRACTOR's review is made in the CONTRACTOR's capacity as a CONTRACTOR and not as a licensed design professional unless otherwise specifically provided in the Contract Documents. The CONTRACTOR is not required to ascertain that the contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the CONTRACTOR shall be reported promptly to the Project Engineer.

#### 16. SUPERVISION AND CONSTRUCTION PROCEDURES

(a) Supervision And Direction 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 the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or

procedures, the CONTRACTOR shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the CONTRACTOR determines that such means, methods, techniques, sequences or procedures may not be safe, the CONTRACTOR shall give timely written notice to the Project Engineer and shall not proceed with that portion of the work without further written instructions from the Project Engineer. If the CONTRACTOR is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the CONTRACTOR, the DISTRICT shall be solely responsible for any resulting loss or damage.

(b) Responsibility Of Work. The CONTRACTOR shall be responsible to the DISTRICT for acts and omissions of the CONTRACTOR's employees, subcontractors, and their agents and employees, and other persons or entities performing portions of the work for or on behalf of the CONTRACTOR or any of its subcontractors.

(c) Subsequent Work. The CONTRACTOR shall be responsible for inspection of portions of work already performed to determine that such portions are in proper condition to receive subsequent work.

(d) Superintendent. The CONTRACTOR shall employ a competent superintendent and necessary assistants who shall be in attendance at the project site during performance of the work. The superintendent shall represent the CONTRACTOR, and communications given to the superintendent shall be as binding as if given to the CONTRACTOR. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

**CONTRACT DOCUMENTS**  
**FOR**  
**CAMP BERRYESSA**  
**IMPROVEMENT PROJECT**

**NAPA COUNTY PARKS AND OPEN SPACE**



**July 2014**

Prepared by

**PSOMAS**

1075 Creekside Ridge Drive, Suite 200  
Roseville, CA 95678

6NAP0101.00

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## SECTION 00300

### WAGE REQUIREMENTS

### WAGE REQUIREMENTS

Notice is hereby given that, pursuant to 1773 of the Labor Code of the State of California, the Owner has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the general prevailing rate for holidays and overtime work for each craft, classification, or type of worker required to execute the Contract. A copy of said prevailing rate of per diem wages is on file in the principal office of the Owner, to which reference is hereby made for further particulars. Said prevailing rate of per diem wages will be made available to any interested party upon request, and a copy thereof shall be posted at each job site.

Statutory Penalty for Failure to Pay Minimum Wages: In accordance with 1775 of the California Labor Code, the Contractor shall as a penalty to the State or political subdivision on whose behalf a Contract is made or awarded, forfeit fifty dollars (\$50.00) for each calendar day or portion thereof, for each worker paid less than the stipulated prevailing rate for any public work done under the Contract by the Contractor or by any Subcontractor under the Contractor.

Statutory Penalty for Unauthorized Overtime Work: In accordance with 1813 of the California Labor Code, the Contractor shall as a penalty to the State or political subdivision on whose behalf the Contract is made or awarded, forfeit twenty-five dollars (\$25.00) for each worker employed in the execution of the Contract by the Contractor or by any Subcontractor for each calendar day during which said worker is required or permitted to work more than eight hours in any one calendar day and forty hours in any one calendar week in violation of 1810-1815 of the California Labor Code.

Apprenticeship Requirements: Contractor agrees to comply with 1777.5, 1777.6 and 1777.7 of the California Labor Code relating to the employment of apprentices. The responsibility for compliance with these provisions is fixed with the prime contractor for all apprenticeship occupations. Under these sections of the law, Contractors and Subcontractors must employ apprentices in apprenticeship occupations, where journeymen in the craft are employed on the public work, in a ratio of not less than one apprentice hour for each five journeymen hours (unless an exemption is granted in accordance with 1777.5) and Contractors and Subcontractors shall not discriminate among otherwise qualified employees as indentured apprentices on any public work solely on the ground of race, religious creed, color, national origin, ancestry, sex, or age, except as provided in 3077 of the Labor Code. Only apprentices, as defined in 3077, which provides that an apprentice must be at least 16 years of age, who are in training under apprenticeship standards and who have signed written apprentice agreements will be employed on public works in apprenticeship occupations.

Payroll Records: Contractor shall keep accurate payroll records on forms provided by the Division of Labor Standards Enforcement, or alternatively, the Contractor shall keep accurate payroll records containing the same information. Said information shall include, but not be limited to, a record of the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and actual per diem wages paid to each journeyman, apprentice, or worker employed by the Contractor. Such record shall be made available for inspection at all reasonable hours, and a copy shall be made available to employee or his authorized representative, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards in compliance with California Labor Code, Section 1776. Upon written notice from the Owner or the Division of Labor Standards Enforcement, the Contractor shall, within ten (10) days, file with the Owner a certified copy of the payroll records. The Contractor shall cause an identical clause to be included in every subcontract for the Work.

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**Notice to Proceed**

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

<b>Project:</b>	
<b>Owner:</b>	<b>Owner's Contract No.:</b>
<b>Contract:</b>	<b>Engineer's Project No.:</b>
<b>Contractor:</b>	
<b>Contractor's Address: [send Certified Mail, Return Receipt Requested]</b>	

**You are notified that the Contract Times under the above Contract will commence to run on \_\_\_\_\_. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is \_\_\_\_\_, and the date of readiness for final payment is \_\_\_\_\_ [(or) the number of days to achieve Substantial Completion is \_\_\_\_\_, and the number of days to achieve readiness for final payment is \_\_\_\_\_].**

**Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.**

**Also, before you may start any Work at the Site, you must:**

\_\_\_\_\_ *[add other requirements].*

	<b>Owner</b>
	<b>Given by:</b>
	<b>Authorized Signature</b>
	<b>Title</b>
	<b>Date</b>

**Copy to Engineer**

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# Certificate of Substantial Completion

Project:

Owner:

Owner's Contract No.:

Contract:

Engineer's Project No.:

**This [tentative] [definitive] Certificate of Substantial Completion applies to:**

- All Work under the Contract Documents:       The following specified portions of the Work:

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\_\_\_\_\_  
Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

**The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:**

- Amended Responsibilities                       Not Amended

Owner's Amended Responsibilities:

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Contractor's Amended Responsibilities:

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
  5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
  7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
  8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
  9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
  10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
  11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

## 1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

### B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

### C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

### D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
  - a. does not conform to the Contract Documents; or
  - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

### E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
  4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## **ARTICLE 2 – PRELIMINARY MATTERS**

### *2.01 Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

### *2.02 Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

### *2.03 Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.



## 2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

## 2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
  - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
  - 2. a preliminary Schedule of Submittals; and
  - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

## 2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

## 2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

### **ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**

#### **3.01 *Intent***

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

#### **3.02 *Reference Standards***

- A. Standards, Specifications, Codes, Laws, and Regulations
  1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
  2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

#### **3.03 *Reporting and Resolving Discrepancies***

- A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
  - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
  1. A Field Order;
  2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

### 3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
  2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

### 3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

## **ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS**

### 4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

#### 4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

- 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

#### 4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

- 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. is of such a nature as to require a change in the Contract Documents; or
- 3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

- B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
  - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
  - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
  - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
  - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

#### 4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
  - a. reviewing and checking all such information and data;
  - b. locating all Underground Facilities shown or indicated in the Contract Documents;
  - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
  - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

#### 4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
  - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
  - 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
  - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to



permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 5 – BONDS AND INSURANCE

### 5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

### 5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

### 5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
  - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
  - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
  - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
    - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
    - b. by any other person for any other reason;
  - 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
  - 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
  - 1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
  - a. Such insurance shall remain in effect for two years after final payment.
  - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

#### 5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

#### 5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of

them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
  3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
  4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
  5. allow for partial utilization of the Work by Owner;
  6. include testing and startup; and
  7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

## ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

### 6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

### 6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

### 6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.



#### 6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
  2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

#### 6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
      - 3) it has a proven record of performance and availability of responsive service.
    - b. Contractor certifies that, if approved and incorporated into the Work:
      - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
      - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

## 2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
  - 1) shall certify that the proposed substitute item will:
    - a) perform adequately the functions and achieve the results called for by the general design,
    - b) be similar in substance to that specified, and
    - c) be suited to the same use as that specified;
  - 2) will state:
    - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
    - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
    - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
  - 3) will identify:
    - a) all variations of the proposed substitute item from that specified, and
    - b) available engineering, sales, maintenance, repair, and replacement services; and
  - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

#### 6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or

entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
  2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

#### 6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its

use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

#### 6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner

and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

#### 6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

## 6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

## 6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts

any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

##### 1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

##### 2. *Samples:*

- a. Submit number of Samples specified in the Specifications.



- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:
  - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
  - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
  1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

#### 6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
  1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

## 6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

## **ARTICLE 7 – OTHER WORK AT THE SITE**

### 7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
  - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
  - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe

access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

#### 7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
  - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
  - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
  - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

## ARTICLE 8 – OWNER’S RESPONSIBILITIES

### 8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### 8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

### 8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### 8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

### 8.05 *Lands and Easements; Reports and Tests*

- A. Owner’s duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

### 8.06 *Insurance*

- A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

### 8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

### 8.08 *Inspections, Tests, and Approvals*

- A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

### 8.09 *Limitations on Owner’s Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws

and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

**ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION**

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations



on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of,

and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

#### 9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

### **ARTICLE 10 – CHANGES IN THE WORK; CLAIMS**

#### 10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

#### 10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

#### 10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
  - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
  - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
  - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of

executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

#### 10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

#### 10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
  - 1. deny the Claim in whole or in part;
  - 2. approve the Claim; or
  - 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

## **ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **11.01 *Cost of the Work***

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
  - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
  - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
  - 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
  - i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
  2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
  5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

## 11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
1. Contractor agrees that:
    - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
    - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in

the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
2. there is no corresponding adjustment with respect to any other item of Work; and
3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

**ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES**

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
  2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
  2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
    - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
    - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.



## 12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

## 12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

## **ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

### *13.01 Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

### *13.02 Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

### *13.03 Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
  - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
  - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
  - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

#### 13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers,

architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

### 13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
1. repair such defective land or areas; or
  2. correct such defective Work; or
  3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

### 13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

### 13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

## **ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION**

### 14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

### 14.02 *Progress Payments*

#### A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

#### B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's

review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
  - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
  - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - c. there are other items entitling Owner to a set-off against the amount recommended; or
  - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.



#### 14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

#### 14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 14.07 *Final Payment*

##### A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
  - b. consent of the surety, if any, to final payment;
  - c. a list of all Claims against Owner that Contractor believes are unsettled; and

- d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

*B. Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

*C. Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

*14.08 Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

#### 14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
  2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

### **ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION**

#### 15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

#### 15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
  2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
  3. Contractor's repeated disregard of the authority of Engineer; or
  4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
  3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

### 15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
  3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other

dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### 15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

### **ARTICLE 16 – DISPUTE RESOLUTION**

#### 16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

## **ARTICLE 17 – MISCELLANEOUS**

### *17.01 Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
  2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### *17.02 Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### *17.03 Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

### *17.04 Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

### *17.05 Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

### *17.06 Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

**SECTION 00800**  
**SUPPLEMENTARY CONDITIONS**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. C-700, 2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

**SC-1.01.A.4 Add the following language to the end of Paragraph 1.01.A.4:**

The Application for Payment form to be used on this Project is EJCDC No. C-620.

**SC-1.01.A.10. Add the following language to the end of Paragraph 1.01.A.10:**

The Change Order form to be used on this Project is EJCDC No. C-941.

**SC-1.01.A.19. Add the following language to the end of Paragraph 1.01.A.19:**

The Design Engineer's Consultants on this project are:

Psomas  
A T.E.E.M. Electrical Engineering, Inc.

**SC 2.02 Delete Paragraph 2.02.A in its entirety and insert the following in its place:**

A. Owner shall furnish to Contractor up to 2 printed or hard copies of the Drawings and Project Manual and one set in electronic format. Additional copies will be furnished upon request at the cost of reproduction.

**SC-4.02. Add the following new paragraphs immediately after Paragraph 4.02.B**

C. In the preparation of Drawings and Specifications, Design Engineer relied upon the following reports of exploration and tests of subsurface conditions at the Site:

1. Onsite Wastewater Feasibility Study for Camp Berryessa, Lake Berryessa, California, Prepared for Napa County Regional Park and Open Space District by Questa Engineering Corporation, July 2009. Note that limited subsurface data was collected in the preparation of



this report for the sole purpose of evaluating the feasibility of developing onsite wastewater disposal, and no additional conclusions should be drawn from the data.

- D. Copies of reports and drawings itemized in SC-4.02.C and SC-4.02.D that are not included with Bidding Documents may be examined at Owner’s office during regular business hours. These reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which the Contractor may rely as identified and established above are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Design Engineer in the preparation of the Drawings and Specifications.

**SC-4.06. Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:**

- A. No reports or explorations or tests of Hazardous Environmental Conditions at or contiguous to the Site are known to the Owner or Design Engineer.
- B. Not Used.

**SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:**

C. Failure of Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.

D. By requiring such insurance and insurance limits herein, Owner does not represent that coverage and limits will necessarily be adequate to protect Contractor, and such coverage and limits shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to Owner in the Contract Documents.

**SC-5.04. Add the following new paragraph immediately after Paragraph 5.04.B:**

C. The limits of liability for insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

- 1. Workers’ Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:

a.	State:	Statutory
b.	Employer’s Liability	\$1,000,000

- 2. Contractor’s General Liability under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages

and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:

- a. General Aggregate \$2,000,000
- b. Products - Completed  
Operations Aggregate \$1,000,000
- c. Personal and Advertising Injury \$1,000,000
- d. Each Occurrence  
(Bodily Injury and Property Damage) \$1,000,000
- e. Excess or Umbrella Liability
  - 1) General Aggregate \$2,000,000
  - 2) Each Occurrence \$2,000,000

3. Automobile Liability under paragraph 5.04.6 of the General Conditions:

- a. Combined Single Limit \$1,000,000

4. Property Damage liability insurance will provide Explosion, Collapse and Underground (X,C,U) coverages where applicable.

5. Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall be provided as part of the General Liability coverage.

6. The Owner, Engineer, Design Engineer, and Design Engineer's Sub-consultants are to be included as additional insureds.

**SC-5.06.A. Delete Paragraph 5.06.A in its entirety and insert the following in its place:**

A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof.

1. This insurance shall:

- a. include the interests of Owner, Contractor, Subcontractors, Engineer and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
- b. in addition to the individuals and entities specified, include as additional insureds, the following:
  - 1) [Here list by name (not genre) other persons or entities to be included on policy as additional insureds];
- c. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work,

temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

- d. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
  - e. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
  - f. allow for partial utilization of the Work by Owner;
  - g. include testing and startup; and
  - h. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.
2. Contractor shall be responsible for any deductible or self-insured retention.
3. The policies of insurance required to be purchased and maintained by Contractor in accordance with this Paragraph SC-5.06.A shall comply with the requirements of paragraph 5.06.C of the General Conditions.

**SC-5.06.E. Delete Paragraph 5.06.E in its entirety and insert the following in its place:**

Not Used.

**SC-6.05.C. Amend the paragraph by making two subparagraphs under the title C. Engineer's Evaluation. The paragraph text is retitled, 6.05.C.2 After Effective Date of Agreement. A new paragraph is added before this paragraph to read as follows:**

- 1. During Bidding. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute or materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function, and quality to be met by any proposed

substitute or “or-equal” item. Request for Engineer’s clarification of materials and equipment considered “or-equal” prior to the Effective Date of the Agreement must be received by the Engineer at least 10 days prior to the date for receipt of Bids. No item of material or equipment will be considered by Engineer as a substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

**SC-6.06. Add two new paragraphs immediately after paragraph 6.06.G:**

- H. The Contractor shall not award work valued at more than fifty (50%) of the Contract Price to Subcontractor(s), without prior written approval of the Owner.
- I. Owner or Engineer may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by a particular Subcontractor or Supplier.

**SC-6.13. Add the following language to the end of paragraph 6.13.B:**

For all excavations in excess of five (5) feet, the Contractor shall, pursuant to Labor Code Section 6705, submit in advance of any excavation hereunder a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from caving ground. No such excavation shall be made until said detailed plan is submitted by Contractor and accepted by Engineer.

**SC-6.17 Add the following new paragraphs immediately after Paragraph 6.17.E:**

- F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. Engineer will record Engineer’s time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring approval and Contractor shall reimburse Owner for Engineer’s charges for such time.
- G. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer’s charges for such time unless the need for such substitution is beyond the control of Contractor.

**SC-9.03. Add the following language at the end of paragraph 9.03:**

The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be stated in the Agreement for Engineering Services executed for this specific Project. Owner will contract for Resident Project Representative services under separate contract.

**SC-10.05. Add the following new paragraph immediately after paragraph 10.05.F:**

G. If this is a "Public Works Contract" as defined in Section 22200 of the California Public Contract Code, claims shall be resolved pursuant to Sections 20104 et seq. of the California Public Contract Code. These sections are summarized as follows:

1. Claim means a separate demand by the Contractor for (a) a time extension, (b) payment of money or damages arising from work done by, or on behalf of the contractor, pursuant to this Contract, payment not otherwise expressly provided the Contract, or (c) any separate demand by the Contractor, the amount of which is disputed by the Owner.
2. For claims less than \$50,000, the Owner shall respond in writing to all written claims within forty-five (45) 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 any defenses the Owner may have against such claim. The Owner's written response to the claim, as further documented, will be submitted to the Contractor within fifteen (15) days from receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional documentation, whichever is greater.
3. For claims over \$50,000 and less than or equal to \$375,000, 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 any defenses the Owner may have against such claim. The Owner's written response to the claim, as further documented, will be submitted to the Contractor within thirty (30) days from receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional documentation, whichever is greater.
4. If the Contractor disputes the Owner's written response, or the Owner fails to respond within the time specified, the Contractor may notify the Owner in writing within either fifteen (15) days of receipt of the Owner's response, or within fifteen (15) days of the Owner's failure to respond within the statutorily prescribed time, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon demand, the Owner shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

5. Following the meet and confer conference, if the claim or any portion remains in dispute, the Contractor may file a claim pursuant to Government Code Sections 900, et seq. The period of time within to file such a claim shall be defined in Public Contract Code Section 20104.2(e).

**SC-14.02.A.3 Add the following language at the end of paragraph 14.02.A.3:**

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

**SC-14.02.A.4. Add the following new paragraph after Paragraph 14.02.A.3**

The Application for Payment Form to be used on this Project is EJCDC No. C-620, as modified and included as Section 00820 of these Contract Documents.

**SC-14.02.C.1. Delete Paragraph 14.02.C.1 in its entirety and insert the following in its place:**

1. Thirty days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

**SC-18 Add a new Article 18, "CALIFORNIA STATE REQUIREMENTS," after Article 17.**

**ARTICLE 18 - ADDITIONAL CALIFORNIA STATE REQUIREMENTS**

20.01 In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. 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 awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

20.02 Unless otherwise indicated in the Contract Documents, all utility lines, conduits, wires, or structures shall be maintained by the Contractor and shall not be disturbed, disconnected, or damaged by him during the progress of the Work, provided, that should the Contractor in the performance of the Work disturb, disconnect, or damage any of the above, all expenses arising

from such disturbance or in the replacement or repair thereof shall be borne by the Contractor. However, in accordance with Section 4215 of the California Government Code, the Contractor shall be compensated for all costs of locating and repairing damage to main or trunkline utility facilities located on the work site and for costs of operating equipment on the work site necessarily idled during such work where the Contractor has exercised reasonable care in removing or relocating utility facilities which are inaccurately indicated in the Contract Documents.

20.03 Notwithstanding any other provision of law, every contract involving the expenditure of public funds in excess of Ten thousand dollars (\$10,000) entered into by any state agency, board, commission, or department or by any other public entity, including a city, county, city and county, or district, shall be subject to the examination and audit of State auditor, at the request of the public entity or as part of any audit of the public entity, for a period of three (3) years after final payment under the contract.

# Progress Estimate

For (contract):				Application Number:			
Application Period:				Application Date:			
A		B	Work Completed		F		G
Item		Scheduled Value	C		Total Completed to Date (C + D)	% (E) B	Balance to Finish (B - F)
Specification Section No.	Description		From Previous Application	This Period			
	<b>Totals</b>						



# Change Order

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

Date of Issuance: \_\_\_\_\_ Effective Date: \_\_\_\_\_

Project:	Owner:	Owner's Contract No.:
Contract:	Date of Contract:	
Contractor:	Engineer's Project No.:	

**The Contract Documents are modified as follows upon execution of this Change Order:**

Description: \_\_\_\_\_  
\_\_\_\_\_

**Attachments (list documents supporting change):**

\_\_\_\_\_

**CHANGE IN CONTRACT PRICE:**

Original Contract Price:  
\$ \_\_\_\_\_

[Increase] [Decrease] from previously approved  
Change Orders No. \_\_\_\_\_ to No. \_\_\_\_\_:  
\$ \_\_\_\_\_

Contract Price prior to this Change Order:  
\$ \_\_\_\_\_

[Increase] [Decrease] of this Change Order:  
\$ \_\_\_\_\_

Contract Price incorporating this Change Order:  
\$ \_\_\_\_\_

**CHANGE IN CONTRACT TIMES:**

Original Contract Times:  Working days  Calendar days  
Substantial completion (days or date): \_\_\_\_\_  
Ready for final payment (days or date): \_\_\_\_\_

[Increase] [Decrease] from previously approved Change Orders  
No. \_\_\_\_\_ to No. \_\_\_\_\_:  
Substantial completion (days): \_\_\_\_\_  
Ready for final payment (days): \_\_\_\_\_

Contract Times prior to this Change Order:  
Substantial completion (days or date): \_\_\_\_\_  
Ready for final payment (days or date): \_\_\_\_\_

[Increase] [Decrease] of this Change Order:  
Substantial completion (days or date): \_\_\_\_\_  
Ready for final payment (days or date): \_\_\_\_\_

Contract Times with all approved Change Orders:  
Substantial completion (days or date): \_\_\_\_\_  
Ready for final payment (days or date): \_\_\_\_\_

RECOMMENDED:  
By: \_\_\_\_\_  
Engineer (Authorized Signature)

ACCEPTED:  
By: \_\_\_\_\_  
Owner (Authorized Signature)

ACCEPTED:  
By: \_\_\_\_\_  
Contractor (Authorized Signature)

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

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

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

Approved by Funding Agency (if applicable):

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

# Change Order

## Instructions

### A. GENERAL INFORMATION

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect Price or Times.

Changes that affect Contract Price or Contract Times should be promptly covered by a Change Order. The practice of accumulating Change Orders to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order should be used.

### B. COMPLETING THE CHANGE ORDER FORM

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Owner or Contractor for approval, depending on whether the Change Order is a true order to the Contractor or the formalization of a negotiated agreement for a previously performed change. After approval by one contracting party, all copies should be sent to the other party for approval. Engineer should make distribution of executed copies after approval by both parties.

If a change only applies to price or to times, cross out the part of the tabulation that does not apply.

**SECTION 01010**  
**SUMMARY OF WORK AND SEQUENCE OF CONSTRUCTION**

**PART 1 - GENERAL**

**1.1 Work Covered by Contract Documents**

- A. The Work includes furnishing products, labor, tools, transportation, and services to construct following:
- a. Grading;
  - b. Gravel surfacing of roadways, parking lots and trails;
  - c. Water system with well pump, water treatment, tank, and distribution,
  - d. Greywater system with subsurface drip disposal;
  - e. Camp host site;
  - f. Tent cabins;
  - g. Combination restroom shower building with composting toilets;
  - h. Covered activity areas;
  - i. Small boar boarding dock;
  - j. Office/Store building;
  - k. Electrical system with photovoltaic array; and
  - l. Miscellaneous other site improvements/modifications.
- B. Furnish and install complete operating engineered systems including appurtenant structural, mechanical and/or electrical mountings fittings or connections required for compliance with Manufacturer's installation requirements, for compliance with applicable building codes and standards, and as needed to permit systems to perform all functions required by Contract Documents and described in Manufacturer's printed literature.

**1.2 Project Location**

- A. The Project is located in Lake Berryessa, California.
- B. Conditions at Project site are as follows:

Ground Elevation: approximately 450 feet above sea level  
Lowest Recorded Temperature: 26° F  
Highest Recorded Temperature: 112° F  
Average Annual Rainfall: 24 inches  
Average Number of Days of Rain (at least 0.1"): 39 days per year

**1.3 Reference Standards**

- A. Standards listed as "Reference Standards" in various sections of these contract documents are hereby incorporated into this specification by reference.
- B. Referenced documents shall include all revisions, amendments, supplements or addenda issued on or before date of advertising for bids.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 Work Sequence**

A. The general sequence of Work shall be as follows:

#### Preparation

1. Before beginning Work, coordinate with servicing electrical utility regarding electric service to site. Obtain required permits, licenses and construction easements. Submit proposed schedule of Work, insurance and bonds. Pothole as needed to supplement staking and marking.
2. Verify well location, field dimensions, and voltage and phase of on-site electrical services. If discrepancies or conflicts are found, bring these to attention of Owner's Representative.
3. Submit shop drawings and other submittals.
4. Begin manufacturing and shipping materials and equipment after receiving approved submittals.

#### Sequencing

5. Complete turnouts and improvements to access road before beginning any other portion of work.
6. Sequence remaining work as needed to prevent conflicts between work items and prevent damage to work completed by subsequent efforts.

#### Closeout

7. Provide operator training, including O&M manuals that contain engineering cut-sheets on all equipment.
8. Provide record drawings.
9. Clean up and restore construction areas.
10. Provide warranty as specified.

### **3.2 Contractor Use of Premises**

A. The following facilities shall remain operational during construction of this project:

1. Install approved signs, barricades and lights necessary to ensure public safety and safety of Owners operators and personnel. Provide steel plates across ditches to enable safe access of Owner's personnel to facilities.

### **3.3 Occupancy**

A. Pre-startup checkout and functional testing shall precede Owner's use of completed Work.

**END OF SECTION**

## **SECTION 01040 COORDINATION**

### **PART 1 - GENERAL**

#### **1.1 Work Included**

- A. Licenses, permits, sales taxes, coordination with Owner, Federal, State and Local authorities, utilities, neighboring property owners, special events and other contractors.

#### **1.2 Related Work**

- A. Section 01200: Project Meetings
- B. Section 01500: Construction Facilities and Temporary Controls

#### **1.3. Permits**

- A. Obtain, pay for, and comply with required permits, licenses, work permits and authorizations from appropriate agencies, including following:

- 1. Licenses

- a. Before submitting bids, Contractors shall be licensed in accordance with provisions of Chapter 9, Division 3, of Business and Professions Code of State of California.

- 2. State and Federal permits

- Owner will obtain and have on hand for Contractor the following permits prior to commencement of construction:

- a. Stormwater Pollution Prevention Permit

- Contractor shall obtain the following permits:

- a. Excavation and Dirt Moving Permit from Cal OSHA
    - b. Safety Permit from California Division of Industrial Safety
    - c. Well demolition permit

- 3. Local permits

- Owner will have these permits on-hand (i.e. issued by regulatory agency) prior to commencement of construction.

- a. Onsite wastewater permit from Napa County
    - b. Building permit from Napa County

#### **1.4 Coordination with Owner**

- A. Notify Owner at least 72 hours before start of construction.

## 1.5 Requests for Information (RFI's)

- A. Immediately upon discovery of need for additional information or interpretation of Contract Documents, Contractor shall prepare and submit an RFI in format specified.
  - 1. Owner's Representative will only respond to RFI's submitted by Contractor. RFI's submitted by other entities will be returned with no response.
- B. Coordinate and submit RFIs in prompt manner to avoid delays in Contractor's Work or Work of subcontractors.
- C. RFI's shall include detailed, legible description of item needing information or interpretation and following:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name of Contractor.
  - 5. Name of Engineer of Record
  - 6. Name of Owner's Representative.
  - 7. RFI number, numbered sequentially.
  - 8. RFI subject.
  - 9. Specification Section number and title and related paragraphs, as appropriate.
  - 10. Drawing number and detail references, as appropriate.
  - 11. Field dimensions and conditions, as appropriate.
  - 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts Contract Time or Contract Sum, Contractor shall state impact in RFI.
  - 13. Contractor's signature.
  - 14. Attachments, including sketches, descriptions, measurements, photos, catalog data, shop drawings, coordination drawings, and other information necessary to fully describe items needing interpretation. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- D. RFI Forms shall be software-generated forms with content shown above, acceptable to Owner's Representative.
- E. Attachments shall be electronic files in Adobe Acrobat PDF format.
- F. Owner's Representative will review each RFI, determine action required, and respond. Allow 7 working days for Owner's response for each RFI. RFIs received by Owner's Representative after 1:00 p.m. will be considered as received following working day.
- G. The following Contractor-generated RFIs will be returned without action:
  - 1. Requests for acceptance of submittals.
  - 2. Requests for acceptance of substitutions where no monetary rebate is included.
  - 3. Requests for acceptance of Contractor's means and methods.
  - 4. Requests for coordination information already indicated in Contract Documents.
  - 5. Requests for adjustments in Contract Time or Contract Sum.
  - 6. Requests for interpretation of actions of Owner's Representative on submittals.
  - 7. Incomplete RFIs or inaccurately prepared RFIs.

- H. Owner's Representative's action may include a request for additional information, in which case Owner's Representative's time for response will date from time of receipt of additional information.
- I. Owner's Representative's action on RFIs that may result in a change to Contract Time or Contract Sum may be eligible for Contractor to submit Change Order requests.
- J. If Contractor believes RFI response warrants change in Contract Time or Contract Sum, notify Owner's Representative in writing within 10 days of receipt of RFI response.
- K. Prepare, maintain, and submit tabular log of RFIs organized by RFI number. Submit log weekly. Include following:
  - 1. Project name.
  - 2. Name and address of Contractor.
  - 3. Name and address of Owner's Representative.
  - 4. RFI number including RFIs returned without action or withdrawn.
  - 5. RFI description.
  - 6. Date RFI was submitted.
  - 7. Date Owner's Representative's response was received.
- L. On receipt of Owner's Representative's action, update RFI log and immediately distribute RFI response to affected parties. Review response and notify Owner's Representative within 7 days if Contractor disagrees with response.

#### **1.6 Coordination with Bureau of Reclamation**

- A. Bureau of Reclamation has reviewing rights for Work. Provide access to Site as directed by Owner's Representative for Bureau personnel.

#### **1.7 Coordination with Property Owners**

- A. Coordinate construction with property owners neighboring project limits.

#### **1.8 Coordination with Utilities**

- A. Obtain service requirements from public utilities for power. Work needed to connect to public utilities shall comply with utility service requirements. Pay service charges of utilities, including charges for trenching, piping, conduit, cables, boxes, metering, grounding and backfill.
- B. Electrical utility companies may maintain energized aerial electrical power lines in immediate vicinity of Work. Do not consider these lines to be insulated. Construction personnel working near these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees, and construction personnel working on this project must be warned of danger and instructed to take adequate protective measures, including maintaining at least 10 feet clearance between lines and construction equipment and personnel. (See OSHA Std. 1926.550(A)15). As an additional safety precaution, call electrical utility company to arrange, if possible, to have these lines de-energized or relocated when Work reaches their immediate vicinity. Cost of such temporary arrangements shall be borne by Contractor.

#### **1.9 Submittals**

- A. Supplementary progress schedules shall be submitted after Work is in progress, when requested by Owner's Representative. Schedule changes requiring an increase in Owner's, Servicing Utility's or City's Engineering personnel on project shall not be put into effect until Owner, Servicing Utility, or City has made arrangements for additional personnel.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**



**SECTION 01048**  
**SPECIAL CONSTRUCTION CONDITIONS AND PROCEDURES - GENERAL**

**PART 1 - GENERAL**

**1.1 Scope**

- A. This section covers special construction conditions and procedures associated with this construction contract.

**1.2 Requirements Covered in Other Specification Sections**

- A. Section 01010: Summary of Work and Sequence of Construction
- B. Section 01040: Coordination

**1.3 Sanitary Arrangements**

- A. Contractor shall be responsible for providing sanitation facilities for his employees and shall fully comply with rules and regulations of State Board of Health and/or other bodies having jurisdiction.
- B. Contractor shall, at all times, provide for his employees abundant supply of safe drinking water and shall give orders against drinking any water in vicinity of Work known to be unsafe.
- C. Contractor shall provide suitable and conveniently located temporary toilets for use by his forces. They shall be maintained in sanitary condition at site until final inspection has been made.

**1.4 Normal Work Schedule**

- A. Contractor shall conduct all Work within following Owner-approved schedule:
  - 1. Normal Work Hours: 8:00 AM to 4:00 PM
  - 2. Normal Work Days: Monday through Friday
- B. Exceptions to this Work schedule shall be only as approved in writing by Owner per Paragraph 1.5 below.

**1.5 Saturday, Sunday, Holiday and Night Work**

- A. No work shall be done between hours of 4:00 p.m. and 8:00 a.m., nor on Saturdays, Sundays or legal holidays, except such work as is necessary for proper care and protection of Work already performed, or except in case of emergency, and in any case only with written notice of Owner.
- B. It is understood, however, night work may be established as a regular procedure by Contractor if they first obtain written notice of Owner. Such notice may be revoked at any time by Owner if Contractor fails to maintain at night adequate force and equipment for reasonable prosecution and to justify inspection of Work.

**1.6 Mitigation Measures**

**1.7 Standardization and Uniformity of Equipment and Certain Materials**

- A. To ensure standardization and uniformity in all parts of Work under this Contract, like items of new (i.e., non-salvaged) equipment shall be products of one manufacturer. Like items of certain

materials shall be products of one manufacturer. Materials, equipment, and appliances shall be current models now in production.

- B. Uniformity in like equipment items is required in order to provide Owner with inter-changeability capabilities, simplified spare parts inventory, and standardized maintenance programs and manufacturers' services.
- C. Standardization requirements are specified in various technical sections.
- D. Generally, material items exempt from standardization include structural steel, reinforcing steel, building insulation, roofing materials, sheet metal, materials specified only by reference to a recognized standard, and items hidden from view where inter-changeability, color, and texture is not a significant factor for standardization.
- E. The Contractor shall inform his suppliers and subcontractors of these requirements, and shall provide necessary coordination to accomplish standardization specified.

### **1.8 Field Tests, Adjustments and Operation**

- A. All mechanical and electrical equipment installed by Contractor shall be operated and tested by Contractor to satisfaction of Owner. Tests shall be made to determine whether equipment has been properly assembled, aligned, adjusted, wired and connected. Any changes, adjustments or replacements of equipment which are due to errors or omissions on the part of Contractor shall be done at their own expense.
- B. Test equipment at rated speeds for required performance, instrumentation control and automatic operation.
- C. Any water, electricity, other utilities, material, supplies, and spare parts used during these tests shall be at the expense of Contractor.
- D. During equipment testing, Contractor shall arrange for presence, as necessary, of representatives of Manufacturers of pieces of equipment furnished, to provide instruction for personnel appointed by Owner in operation and care thereof. Contractor shall bear cost of providing qualified instruction personnel.

### **1.9 Lubricants**

- A. All equipment shall be properly lubricated and furnished with a one (1) year supply of all necessary lubricants.

### **1.10 Services of Manufacturer's Representative**

- A. Provide services of factory-trained and authorized Manufacturer's representative familiar with all equipment to supervise installation of equipment furnished and its start-up. Cost for this service shall be included in bid price.
- B. Manufacturer's representative shall check all equipment for lubrication, alignment, rotation, and vibration, and shall notify Contractor and Owner of anything in installation which might nullify Manufacturer's warranty.
- C. Manufacturer's representative shall also provide instruction to operating personnel in proper method of operation and recommend lubrication (products and schedule).
- D. Minimum on-site services of Manufacturer's representatives shall be as specified elsewhere herein (reference specific specification sections for various equipment), or if not specified, shall be as necessary for proper installation by Contractor and proper instruction of Owner in use and maintenance of Work.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**

## SECTION 01070

### ABBREVIATIONS

#### PART 1 - GENERAL

##### 1.1 Work Included

A. This section lists abbreviations and defines them for use in these Contract Documents.

##### 1.2 References

A. Publications listed below form part of this specification to extent referenced and are referred to in text by basic designation only. Reference shall be made to latest edition of said standards at time of bid.

1. CSI TD-2-4 - Construction Specifications Institute Abbreviations
2. SSPWC - Standard Specifications for Public Works Construction "Greenbook"

##### 1.3 Application

A. When references are made in these specifications to standards, specifications, or other published data of various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only.

B. If an abbreviation is not listed below refer to CSI TD-2-4

C. Where use of Standard Specifications for Public Works Construction "Greenbook" is made, refer to SSPWC for use and description of abbreviations.

D. Interpretation of abbreviations shall consider context or discipline in which they are used. For example:

1. FF means "finish floor" when referring to a floor slab.
2. FF means "flat face" when referring to a pipe flange.

E. Refer discrepancies to Owner's Representative for interpretation.

##### 1.4 List of Abbreviations

A	Ampere / Area / Architectural Sheet
AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
AB	Anchor Bolt / Aggregate Base
ABAN	Abandoned
ABC	Asphalt Base Course
AC	Acre / Asphalt Concrete / Alternating Current
ACI	American Concrete Institute
ACP	Asbestos-Cement Pipe
ACU	Access Door
AE	Architect-Engineer
AFF	Above Finished Floor
AGG	Aggregate
AI	The Asphalt Institute

AIA	American Institute of Architects
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
AL	Aluminum
AMB	Ambient
AMP	Ampere
ANG	Angle
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ARCH	Architecture / Architectural
ARV	Air-Release Valve
ARVV	Air-Release and Vacuum Valve
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPH	Asphalt
ASSY	Assembly
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer Switch
AVE	Avenue
AVG	Average
AWG	American Wire Gage
AWS	American Welding Society
AWWA	American Water Works Association
BB	Back-to-Back
BC	Beginning of Curve / Back of Curb / Bare Copper
BEG	Begin
BETW	Between
BF	Blind Flange
BHP	Brake Horsepower
BK	Back / Brake
BKR	Breaker
BL	Building
BLK	Block
BLVD	Boulevard
BM	Bench Mark / Beam
BO	Blow off
BOP	Bottom of Pipe
BOT	Bottom
BP	Baseplate
BRG	Bearing
BRNZ	Bronze
BTN	Button
BTU	British Thermal Unit
BUR CBL	Buried Cable
BFV	Butterfly Valve
BVC	Begin Vertical Curve
BW	Block Wall

C	Conduit / Celsius / Civil Drawings / Copper
CAB	Crushed Aggregate Base
CAP	Capacity
CB	Catch Basin / Circuit Breaker
CBC	California Building Code
CC	Cooling Coil
C-C	Center-to-Center
CCB	Concrete Block
CD	Cross Drain / Condensate Drain / Ceiling Diffuser
CEM	Cement
CF	Cubic Feet / Curb Face
CFC	California Fire Code
CFH	Cubic Feet Per Hour
CFM	Cubic Feet Per Minute
CFS	Cubic Feet Per Second
CG	Construction Grade
C&G	Curb and Gutter
CHG	Change
CHKD PL	Checkered Plate
CI	Cast Iron
CIP	Cast In Place / Cast-Iron Pipe
CISP	Cast Iron Soil Pipe
CISPI	Cast-Iron Soil Pipe Institute
CJ	Construction Joint
CL	Centerline / Class / Clearance / Chlorine
CLR	Clear
CMC	California Mechanical Code
CMLCSP	Cement-Mortar Lined & Coated Steel Pipe
CMLSP	Cement-Mortar Lined Steel Pipe
CMP	Corrugated Metal Pipe
COMPA	Corrugated Metal Pipe Arch
CMU	Concrete Masonry Unit
CO	Cleanout / Conduit Only
COL	Column
COMM	Communication
COMP	Composite
COMPL	Complete
CONC	Concrete
CONN	Connection
CONST	Construct or Construction
CONT	Continuous
CONTR	Contractor
COORD	Coordinate / Coordinated
COP	Copper
COR	Corner
CORP	Corporation
CP	Cathodic Protection
CPC	California Plumbing Code
CPLG	Coupling
CPVC	Chlorinated Polyvinyl Chloride
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard, US Department of Commerce
CT	Center Top / Current Transformer
CTG	Coating

CTR	Center
CULV	Culvert
CU YD, CY	Cubic Yard
CYL	Cylinder
D	Degree of Curvature
DB	Direct Buried / Decibel
DBL	Double
DC	Direct Current
DEPT	Department
DET	Detail / Detour
DG	Decomposed Granite
DI	Drop Inlet
DIA	Diameter
DIAG	Diagonal
DIM	Dimension
DIMJ	Ductile-Iron Mechanical Joint
DIP	Ductile-Iron Pipe
DIPRA	Ductile-Iron Pipe Research Association
DISCH	Discharge
DIST	Distance
DMH	Drop Manhole
DN	Down
DR	Drain / Door
DSL	Diesel
DWG	Drawing
DWY	Driveway
E	East / Electrical Drawings
EA	Each
EC	End of Curve
ECC	Eccentric
ED	External Distance
EE	Each End
EF	Each Face / Exhaust Fan
EFF	Efficiency
EFL	Effluent
EGL	Energy Grade Line
EL	Elevation / Each Layer
E/L	Easement Line
ELEC	Electric
ELP	Elliptical
ENC	Encasement or Encased
ENCL	Enclosure
ENG	Engine
ENGR	Engineer
EOS	Equivalent Opening Size
EP	Edge of Pavement / Explosion Proof
EPA	Environmental Protection Agency (Federal)
EQ	Equation
EQL	Equal
ESMT	Easement
EST	Estimate or Estimated
ETC	And so Forth

EVC	End Vertical Curve
EW	Each Way
EXC	Excavate or Excavation
EXP	Expansion
EXST	Existing
EXT	Exterior / Extension
F	Fahrenheit / Floor
FAB	Fabricate
FBRBD	Fiberboard
FC	Foot-Candle
FCO	Floor Cleanout
FCV	Flow Control Valve
FD	Floor Drain
FDN	Foundation
FE	Flanged End / Fence
Fed Spec	Federal Specification
FF	Finished Floor / Flat Face
FG	Finished Grade
FH	Fire Hydrant
F&I	Furnish and Install
FIG	Figure
FIP	Female Iron Pipe Thread
FIPT	Female Iron Pipe Thread
FIT	Fitting
FL	Floor / Flow Line
FLG	Flange
FM	Force Main / Factory Mutual
FMH	Flexible Metal Hose
FNSH	Finish
FOC	Face of Concrete
FPC	Flexible Pipe Coupling
FPM	Feet Per Minute
FPS	Feet Per Second
FS	Finished Surface / Floor Sink / Federal Specifications
FSTNR	Fastener
FT	Feet
FTG	Footing
FUT	Future
G	Gas / General Drawings / Gram
GA	Gage
GAL	Gallon
GALV	Galvanized
GB	Grade Break
GDR	Guard Rail
GR	Grooved End
GENL	General
GFI	Ground Fault Interrupter
GM	Gas Main
GND	Ground
GPD	Gallons Per Day
GPM	Gallons Per Minute
GR	Grade



GSKT	Gasket
GUT	Gutter
GV	Gate Valve
H	Humidistat / Horizontal
HARN	Harness
HB	Hose Bib
HD	Heavy Duty
HDPE	High-Density Polyethylene Pipe
HGL	Hydraulic Grade Line
HGT	Height
HMWPE	High-Molecular Weight Polyethylene
HORIZ	Horizontal
HP	Horsepower / High Pressure
HPT	High Point
HR	Hour / Handrail
HS	High Strength
HV	Hose Valve
HVAC	Heating, Ventilating, and Air Conditioning
HW	Headwall / Hot Water
HWL	High Water Level
HWY	Highway
HYDR	Hydraulic
HZ	Hertz (cycles per second)
I	Intersection Angle / Instrumentation Drawings
ICBO	International Conference of Building Officials
ICC	International Code Council
ID	Inside Diameter
IE	Invert Elevation
IN	Inches
INCL	Include
INL	Inlet
INSUL	Insulating
INSTL	Install or Installation
INT	Interior
INTR	Intersection
INV	Invert
I/O	Inlet / Outlet
IP	Iron Pipe
IPS	Iron Pipe Size
IPT	Iron Pipe Thread
IRR	Irrigation
JB	Junction Box
JCT	Junction
JN	Join
JT	Joint
KG	Kilogram
KM	Kilometer
KIPS	Thousands of Pounds
KPA	Kilopascal
KV	Kilovolt
KW	Kilowatt

KWH	Kilowatt-Hour
KWHM	Kilowatt-Hour Meter
L	Length of Curve / Long / Landscaping Drawings
LATL	Lateral
LB	Pound
LCL	Local
LF	Linear Foot
LNDSKP	Landscaping
LOCN	Location
LP	Light Pole
LPG	Liquified Petroleum Gas
LPT	Low Point
LR	Long Radius
LS	Lift Station
LT	Left / Light
LWC	Lightweight Concrete
LWIC	Lightweight Insulating Concrete
LWL	Low Water Level
M	Mechanical Drawings / Meter
MATL	Material
MAX	Maximum
MB	Machine Bolt / Megabyte / Millibars
MC	Metal Channel
MCM	Thousand Circular Mils
ME	Machined End
MECH	Mechanical
MFR	Manufacturer
MG Million	Gallons / Milligram
MGD Million	Gallons Per Day
MH	Manhole
MHZ	Megahertz
MI	Malleable Iron / Mile
MIL	Military Specifications
MIL-	Military Specification (leading symbol)
MIN	Minimum
MIP	Male Iron Pipe Thread
MISC	Miscellaneous
MJ	Mechanical Joint
MM	Millimeter
MO	Motor Operator / Motor Operated / Masonry Opening
MOD	Modification
MON	Monument
MOT	Motor
MOV	Motor Operated Valve
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MTD	Mounted
N	North / Neutral / Nitrogen
NA	Not Applicable
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards

N & C	Nail and Cap
NC	Normally Closed
NCV	Normally Closed Valve
NE	Northeast
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFC	National Fire Code
NFPA	National Fire Protection Association
NIC	Not in Contract
NIP	Nipple
NO	Number / Normally Open
NOM	Nominal
NPT	National Pipe Taper
NRS	Non-Rising Stem
NSF	National Sanitation Foundation
NTS	Not to Scale
NW	Northwest
NWL	Normal Water Level
OA	Overall / Outside Air
OC	On Center / Overcurrent
OD	Outside Diameter
OE	Or Equal
OF	Outside Face
OFCI	Owner-Furnished Contractor-Installed
OFRC	Owner-Furnished Contractor-Relocated
OPER	Operator
OPNG	Opening
OPP	Opposite
OSHA	Occupational Safety and Health Administration, U.S. Department of Labor, as defined in General Conditions
OS&Y	Outside Screw and Yoke
O TO O	Out to Out
OUTL	Outlet
OVFL	Overflow
OVHD	Overhead
P	Pole
PARA	Paragraph
PB	Push Button / Pull Box
PC	Point of Curvature / Programmable Controller
PCA	Portland Cement Association
PCC	Point of Compound Curvature / Portland Cement Concrete
PE	Plain End / Polyethylene / Professional Engineer
PEN	Penetration
PG	Pressure Gage
PI	Point of Intersection
PJTN	Projection
PKWY	Parkway
PL	Plate / Property Line
PLATF	Platform
PLF	Pounds Per Lineal Foot
PM	Parcel Map
PNL	Panel

PO	Push-On
POB	Point of Beginning
POC	Point of Connection
PE	Polyethylene
POR	Portion
PP	Power Pole / Polypropylene
PPB	Parts Per Billion
PPI	Plastic Pipe Institute
PPM	Parts Per Million
PR	Pair
PRC	Point of Reverse Curve
PRESS	Pressure
PRL	Parallel
PRPSD	Proposed
PRVC	Point of Reverse Vertical Curve
PSI	Pounds Per Square Inch
PSIG	Pounds Per Square Inch Gage
PSF	Pounds Per Square Foot
PT	Point of Tangency
PV	Plug Valve
PVC	Polyvinyl Chloride / Point of Vertical Curvature
PVI	Point of Vertical Intersect
PVMT	Pavement
PWR	Power
Q	Flow Rate
QTY	Quantity
R	Right / Radius
RAF	Return Air Fan
RC	Reinforced Concrete
RCP	Reinforced Concrete Pipe
RCPA	Reinforced Concrete Pipe Arch
RD	Road
RDC	Reduce
RDCR	Reducer
RDWY	Roadway
REF	Reference
REINF	Reinforce or Reinforced
RELOC	Relocate
REQD	Required
RES	Reservoir
REV	Revise / Revision
RF	Raised Face
RH	Relative Humidity
RJ	Restrained Joint
RND	Round
RM	Record Map
ROS	Record of Survey
RPM	Revolutions Per Minute
RS	Road Survey / Rising Stem
RSD	Regional Standard Drawings
RST	Reinforcing Steel
RT	Right

R/W	Right-of-Way
RWGV	Resilient-Wedge Gate Valve
S	South
SA	Sweetwater Authority
SAE	Society of Automotive Engineers
SAN	Sanitary
SC	Seal Coat
SCADA	Supervisory Control and Data Acquisition
SCFM	Standard Cubic Feet Per Minute
SCHED	Schedule
SCRN	Screen
SD	Storm Drain
SDG	Siding
SE	Southeast
SECT	Section
SF	Square Feet
SGL	Single
SH	Sheet / Sheeting / Shielded / Structural Sheet
SHT	Sheet
SIM	Similar
SKWK	Sidewalk
SLP	Slope
SLV	Sleeve
SM	Sheet Metal
SOL	Solenoid
SOV	Solenoid-Operated Valve
SP	Space / Steel Pipe / Static Pressure / Spare / Stand Pipe
SPCG	Spacing
SPEC	Specification
SPLC	Splice
SPRT	Support
SQ	Square
SS	Sanitary Sewer
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
SS	Stainless Steel
ST	Street
STA	Station
STBY	Standby
STD	Standard
STK	Stake
STL	Steel
STR	Straight
STRL	Structural
STRUCT	Structure
STS	Storm Sewer
SURF	Surface
SW	Southwest
SWG	Swing
SYMM	Symmetrical
SYS	System

T	Ton / Tangent Length of Curve
TAN	Tangent
T/B	Top of Beam
TB	Top of Bank / Terminal Board
T&B	Top and Bottom
TBG	Tubing
TBM	Temporary Bench Mark
TC	Top of Curb
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
TEL	Telephone
TEMP	Temperature / Temporary
THB	Thrust Block
THD	Thread or Threaded
THH	Thrust Harness
THK	Thick
TO	Turnout
T/O	Top of
TOC	Top of Concrete / Top of Curb
TOP	Top of Pipe
TOS	Top of Slab
TOT	Total
TP	Telephone Pole
TRD	Thread
TRA	Tie Rod Assembly
TS	Tube Sheet
TYP	Typical
UBC	Uniform Building Code
UD	Underdrain
UG	Underground
UL	Underwriters Laboratories, Inc.
ULT	Ultimate
UON	Unless Otherwise Noted
UPC	Uniform Plumbing Code
UTC	Underground Telephone Cable
UTIL	Utilities
V	Vent / Valve / Volt / Vertical
VAC	Vacuum / Volts, Alternating Current
VC	Vertical Curve
VEL	Velocity
VERT	Vertical
VFD	Variable Frequency Drive
VOL	Volume
VPC	Vertical Point of Curve
VPI	Vertical Point of Intersection
VPT	Vertical Point of Tangency
W	West / Watt / Wide / Water / Wire
W/	With
WADG	Water Agencies' Design Guide
WAS	Water Agencies' Standards
WASC	Water Agencies' Standards Committee

WE	Weld End
WG	Water Gage
WL	Waterline
WLD	Welded
WM	Water Meter
W/O	Without
WOG	Water Oil Gas
WP	Waterproof / Working Point
WSE	Water Surface Elevation
WSP	Water Stop
WT	Weight
WTR	Water
WWF	Welded Wire Fabric
WWM	Woven Wire Mesh
WWR	Welded Wire Reinforcement
YCO	Yard Cleanout
YD	Yard
YP	Yield Point
YR	Year
YS	Yield Strength

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**

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**SECTION 01200  
PROJECT MEETINGS**

**PART 1 - GENERAL**

**1.1 Scope**

- A. This section addresses requirements for preconstruction meeting, progress meetings, specially called meetings and post-construction meeting.
- B. Owner's Representative will schedule and conduct meetings and conferences at Work site unless otherwise indicated.

**1.2 Contractor's Responsibilities**

- A. Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
- B. For all meetings other than those required by Contract Documents or Owner's Representative, Contractor shall record minutes, including significant proceedings and decisions for each meeting. Contractor shall reproduce and distribute copies of minutes within 5 days after each meeting. Contractor shall provide copies to Owner's Representative, all other participants in meeting, and all other parties affected by decisions made at meeting.

**1.3 Preconstruction Meeting**

- A. Before issuance of Notice to Proceed, a preconstruction meeting will be held at a time and location designated by Owner's Representative.
- B. Meeting shall be attended by Owner's Representative, Engineer of Record, Representatives from Napa County, Bureau of Reclamation, and Pacific Gas and Electric, Contractor and his superintendent, all major subcontractors and other persons designated by Owner.
- C. Agenda for meeting shall include following items as a minimum.
  - 1. Scheduling items
    - a. Tentative construction schedule
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Procedures for schedule revisions
  - 2. Designation of key personnel and their duties.
    - a. Designation of persons authorized to sign documents for Owner and Contractor, with examples of signature of each.
    - b. List of names, addresses and telephone numbers of those persons authorized to act for Contractor in emergencies
    - c. Safety procedures including designation of Contractor's safety officer.

3. Lines of communications.
  - a. Procedures for processing field decisions and Change Orders.
  - b. RFI procedures
  - c. Submittal procedures
  - d. Testing and inspection procedures.
  - e. Payment application and processing procedures.
  - f. Change Order procedures
4. Distribution of Contract Documents.
5. Preparation of record drawings.
  - a. Title 24 Energy Code documentation.
6. Use of premises,
  - a. Parking availability.
  - b. Office, work, and storage areas.
  - c. Equipment deliveries and priorities.
  - d. Work restrictions.
  - e. Working hours.
  - f. Owner's occupancy requirements.
  - g. Responsibility for temporary facilities and controls including barricades, utilities, sanitary facilities, signs and other facilities required.
  - h. Procedures for moisture and mold control.
  - i. Procedures for disruptions and shutdowns.
  - j. Construction waste management and recycling.
7. First aid.
8. Security.
9. Progress cleaning and housekeeping.
10. Construction permit requirements, procedures and posting.
11. Establishment of a schedule for progress meetings.
12. Other administrative items as appropriate.

#### **1.4 Progress Meetings**

- A. Progress meetings shall be held at dates and times scheduled at preconstruction meeting unless changes are agreed to by all parties and appropriate notification of such changes has been given.
- B. Meetings shall be attended by Owner's Representative and Contractor's superintendent. When requested by Owner's Representative or Contractor; subcontractors, and Owner's consultants shall also attend.
- C. Agenda for these meetings shall include following items:
  - 1. Review progress of construction since previous meeting.
  - 2. Discuss field observations, problems and conflicts.
  - 3. Identify problems which impede planned progress and develop corrective measures as required to regain projected schedule. Revise construction schedule if necessary.
  - 4. Plan progress during next construction period.
  - 5. Coordinate progress of subcontractors.
  - 6. Review changes proposed by Owner for their effect on construction schedule and completion time.
  - 7. Review Contractor's record drawings.

#### **1.5 Special Meetings**

- A. Upon appropriate notice to other parties, special meetings may be called by Owner's Representative or Contractor, at times agreed to by all parties involved.

#### **1.6 Post-construction Conference**

- A. When Contractor notifies Owner and Engineer that work is complete (see General Conditions, a post-construction conference shall be held after to discuss and resolve all unsettled matters.
- B. Prior to post-construction conference, bonds and insurance to remain in force, and other documents required to be submitted by Contractor will be reviewed and deficiencies identified if any.
- C. Agenda shall include following items:
  - 1. Preparation of record documents.
  - 2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
  - 3. Submittal of written warranties.
  - 4. Requirements for submitting operations and maintenance data.
  - 5. Requirements for delivery of spare parts.

6. Requirements for demonstration and training.
7. Preparation of Contractor's punch list
8. Contractor's schedule for addressing punch list items.
9. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
10. Coordination with other contractors on site.
11. Owner's partial occupancy requirements.
12. Installation of Owner's furniture, fixtures, and equipment.
13. Responsibility for removing temporary facilities and controls.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**

## SECTION 01330

### SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

##### 1.1 Work Included

- A. General procedures and requirements for Submittals, initial submittal, submittals required on Owner's request, progress reports, submittals and samples, notification of affected residences and businesses, and submittal forms.
- B. Definition of "Submittal" in these documents is synonymous with the term "Shop Drawings" in the General Conditions.
- C. Requirements for Substitutions are contained in Article 6 of General Conditions.
- D. Requirements for Delegation of Professional Design Services are contained in Article 6 of General Conditions.

##### 1.2 Related Work

- A. Section 01321: Construction Photographic and Video Documentation
- B. Section 01400: Quality Requirements
- C. Section 01610: Product Requirements
- D. Section 01630: Product Substitution Requirements
- E. Section 01650: Product Delivery, Storage and Handling Requirements
- F. Section 01700: Execution Requirements

##### 1.3 Electronic (Digital) Submittals

- A. Submit one (1) digital copy of **each** submittal using one of following methods:
  - 1. Email: Send submittal as pdf attachment to Owner and Owner's Representative.
  - 2. Data tracking System (DTS): Upload digital file to server maintained by Owner's Representative.
  - 3. CD: Burn a CD containing one or more submittals and furnish copy of CD to Owner and Owner's Representative.
- B. Multiple hard copies of submittals will not be accepted in lieu of digital submittal unless otherwise authorized or directed by Owner's Representative.
- C. One digital copy of stamped submittal with cover letter will be returned to Contractor by email or DTS as appropriate.
- D. It shall be Contractor's responsibility to verify emails sent with large attachments have been successfully received by Owner and Owner's Representative. Files in excess of 5 MB in size shall not be sent as attachments to emails due to size restrictions associated with users' email systems.
- E. Number submittals using numbering system as directed by Owner's Representative.

- F. Shop Drawing Transmittal Form. Use form included at end of this section unless otherwise directed by Owner. Submit a separate form for each submittal and assign a submittal number. Form shall be first page of each digital submittal. Submittals without completed Contractor's Transmittal Form as their first page will be returned without review and stamped "REJECTED/RESUBMIT AS SPECIFIED."
- G. Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
- H. Exceptions and departures from Contract Documents shall be clearly noted, along with brief justification for each exception or departure.

#### **1.4 Owner's Review of Submittals**

- A. Owner's review or acceptance of submittals shall only constitute acceptance of following:
  - 1. Portions of submittal in compliance with Contract Documents.
  - 2. Exceptions or departures expressly noted on Contractor's submittal as "exceptions" or "departures" and accepted in writing by Owner.
  - 3. Exceptions or departures Owner or their Representative may by chance discover and acknowledge and accept in writing in Owner's response to said submittal.
- B. In the event a submittal's exception or departure from Contract Documents is neither noted by Contractor on their submittal nor acknowledged and expressly accepted by Owner, Contract shall remain unchanged. Owner's failure to discover all exceptions and departures in submittals whether intentional or unintentional on Contractor's part shall in no way relieve Contractor of any Contract responsibilities.
- C. Review of submittals will proceed as follows:
  - 1. Submit specified quantity of complete submittals together with Contractor's submittal forms to Owner's Representative for review. At Owner's discretion, Owner can review submittals prior to, parallel with, or after Owner's Representative has reviewed submittals.
  - 2. Submittals will be stamped "NO EXCEPTIONS NOTED", "MAKE CHANGES NOTED", "REVISE AS NOTED/RESUBMIT", "REJECTED/RESUBMIT AS SPECIFIED," "NO ACTION REQUIRED," or "SUBMITTAL NOT REQUESTED, RETURNED WITHOUT REVIEW." Three copies with letter of transmittal will be returned to Contractor.
  - 3. If drawing or data is returned stamped "NO EXCEPTIONS NOTED", "MAKE CHANGES NOTED", "NO ACTION REQUIRED," or "SUBMITTAL NOT REQUESTED, RETURNED WITHOUT REVIEW." No further resubmittals will be required for that item.
  - 4. If drawing or data is stamped "REVISE AS NOTED/RESUBMIT," or "REJECTED/RESUBMIT AS SPECIFIED," make necessary corrections and resubmit documents as required in Instruction 1. Contractor's submittal form transmitting revised documents shall show that documents comprise a resubmittal.

Revisions and re-submittals shall be numbered as Revision #1, Revision #2, or as appropriate.

5. If changes other than those noted by Owner are made on a submittal before resubmittal, note such changes on resubmittal.
  6. Revise and resubmit submittals as required, until confirmation of compliance is obtained.
- D. Allow not less than 31 calendar days for review and response to submittals. Review may be delayed if contingent on receipt of other submittals. Upon timely written request by Contractor, Owner's Representative will make reasonable efforts to shorten review periods which may fall on Contractor's critical path.
- E. Correct and resubmit rejected submittals within 14 calendar days.
- F. Do not order products or begin work described in required submittals until such submittals have been reviewed and returned by Owner stamped "NO EXCEPTIONS NOTED" or "MAKE CHANGES NOTED". Contractor's acceptance of delivery of products prior to receipt of Owner's Representative's satisfactory return of applicable submittals shall be at Contractor's risk.
- G. Review of submittals by Owner's Representative shall extend solely to general type and layout of Work and shall not be construed as relieving Contractor of full responsibility for adequacy and accuracy of submitted designs and details shown in submittals.

## **1.5 Required Submittals**

- A. General
1. Provide Submittals as required in technical provisions.
- B. Initial Submittal
1. Documents as required in Article 2 of General Conditions
  2. Submit following within 10 days after the Effective Date of the Agreement:
    - i. Names and addresses of Manufacturers furnishing products valued greater than either 4 percent of contract value or \$40,000, whichever is less. State locations of shops at which manufacture will take place. State whether products are already designed or in production. Include a brief description of products proposed, including sizes and catalog numbers.
- C. Submittals on Owner's Request - Supplemental Information
1. Detailed construction schedule updates shall be submitted, with monthly pay requests to describe scheduling of elements of construction requiring Owner's or Contractor's coordination with public, or other private parties or public agencies.
  2. Supplemental information will be requested for "accepted equals" and may be requested when there is a question a Manufacturer's product conforms to Contract Documents. Owner reserves right to require submittal of supplemental information as described herein before acceptance of product.

3. Certification of compliance with listed reference standards shall be submitted by Manufacturers on Owner's request. Failure of Owner to request certification of compliance shall not serve as waiver of Contractor's duty to comply with reference standards.
4. Transcripts of results of acceptance tests performed at point of manufacture of products furnished shall be submitted by Manufacturers on Owner's request.
5. Samples shall be submitted on Owner's request.
6. Names and addresses of nearest local service representatives maintaining technical service personnel and complete inventory of spare parts and accessories shall be submitted on Owner's request.
7. List of 3 installations in which products comparable in size, capacity and rating with those required in Contract Documents are now in regular operation shall be submitted on Owner's request. Include listing of size capacity or rating of each installation. Include name and telephone number of at least one reference responsible for operations at each installation whom Owner's Representative may contact.

#### D. Progress Reports

1. Daily log shall be submitted by Contractor's superintendent on a one page form provided by Owner. These logs shall be detailed with activities that took place during each day. Submit logs daily to Owner's Representative by end of following workday.
2. Schedule updates shall be submitted with monthly pay requests. If Work falls behind schedule, monthly pay requests shall include revised schedules to demonstrate how Contractor intends to bring work back on schedule.
3. Record drawings, consisting of one set of full size annotated blueline Drawings and shop drawings, showing installed locations of improvements and all changes made during construction shall be available to Owner for inspection throughout project. Record all deviations from Contract Documents, including accepted change orders, using additional sketches or ink revisions, immediately after installing each portion of Work. Show locations of underground piping, conduit, sensor lines, valves, capped ends, branch fittings, pull boxes and Work. Keep one current record copy of Contract Documents, addenda, supplementary drawings, working drawings, change orders and clarifications at site and in good order. Report changes and deviations promptly to Owner's Representative.
4. Partial payment requests may be withheld if daily logs, schedule updates or record drawings are damaged, lost or not kept current to satisfaction of Owner's Representative.

#### E. Contractor's Notice of Pending Delay Claim

1. In event a delay claim is foreseen by Contractor, Contractor shall immediately notify Owner in writing. Following said notice, Contractor shall have no more than 7 calendar days to furnish follow-up information as is required by Owner to allow Owner to act judiciously to minimize losses. As a minimum, said information shall



consist of a letter identifying and substantiating cost of expected claim per day of delay accompanied by schedule showing any available float and delay's impact on overall schedule.

## **1.6 Submittal Requirements**

- A. Except where preparation of a submittal is contingent upon acceptance of a prior submittal, Contractor shall make every reasonable effort to combine all submittals relating to same class or portion of Work into a common package, regardless of variety of trades or types of equipment that may be required to construct that portion of Work. e.g. all above ground piping, fittings, valves, actuators, pipe stands, couplings, flow meters and appurtenances shall be submitted as one package for review.
  - 1. Packages that are clearly incomplete will be returned without review.
  - 2. To facilitate approval of critical path items or to facilitate Contractor's communication with multiple suppliers and subcontractors, packages may contain several submittals from several suppliers so long as all relevant submittals are contained in package.
  - 3. Where expedited review of a single submittal within a package is desired to facilitate critical path items, notify Owner's Representative in writing to request expedited review of said item. Contractor's request for expedited review of a portion of a package of submittals shall be taken as full acceptance of responsibility by Contractor for any subsequent field modifications or substitutions later found necessary to correct any lack of coordination between expedited submittals and other submittals or to correct any lack of coordination between expedited submittals and Contract Documents s not brought to Owner's attention at time of submittal.
- B. Catalog cuts may be Manufacturer's pre-printed drawings and need not include project name. However, where multiple products or options are shown in same catalog cut, product or option being furnished shall be clearly delineated as specified below.
- C. All submittals shall show US units. For submittals prepared in foreign countries where Manufacturer's literature is printed solely in metric units, Contractor may make hand annotations to convert to US units as long as annotations are clear and legible. Submittals not bearing US units will be returned without review.
- D. Submittals bearing text in languages other than English will be returned without review.
- E. Drawings of assemblies included in submittals (commonly known as "shop drawings") shall include following:
  - 1. Key or index showing locations of all pieces.
  - 2. Order of installation. Each piece shall receive a unique mark number. No other piece, even in another area of the Work, shall have same mark number. Sequential order of mark numbers shall correspond to a logical order of installation.
  - 3. Size, dimensions, clearances and tolerances for all pieces.
  - 4. Clearly legible drawing showing each piece in plan view and, when necessary to completely show piece, in profile.

5. For pipelines, station and invert elevation of all grade changes and changes in horizontal alignment, and slopes of pipe not vertical or horizontal.
6. Couplings and connection information.
7. Proposed surface preparation, primers, and linings/coatings including thicknesses.
8. How connections will be made between Work under this contract and existing work or work under other contracts.
9. Details of supports including locations, anchor bolt sizes, and embedments.
10. Welding details.

F. Drawings included in submittals for equipment shall include following:

1. Laying lengths and dimensions, clearances, tolerances and end types.
2. Weight and type of equipment.
3. Port sizes and tolerances.
4. Dimensions and orientation of actuators and pilot systems. Locations of actuator stops.
5. Proposed surface preparation, primers, and linings/coatings, including thicknesses.
6. Performance characteristics.
7. Parts and materials lists and ratings and details of appurtenances to be furnished, along with references to appropriate ASTM, Federal Specifications and other reference standards and grades.
8. Elevations showing arrangements and positions of all panel components including nameplates.
9. Electrical diagrams as needed to show wiring circuit schematics, single line diagrams, voltage wire numbers and identified interlocks and terminals.
10. Logic diagrams for programmable controllers or relays if used.
11. Nameplate data showing nameplate material, height of letters, number of lines, inscriptions and dimensions.

G. Drawings for structural and architectural items shall include following:

1. Lengths, widths, thickness, embedment, dimensions and tolerances of structural members or architectural items.
2. Detailing of openings and wall penetrations including doors, windows, hatches, louvers, vents, ducts, pipes and all floor, slab, wall and door penetrations.

3. Connection details including applicable sizes, diameters, thickness, spacing, embedment and edge distances of bolts, anchors, rivets, nails, screws, spikes, connection plates, holdowns, joints, sleepers and other fasteners and fastening systems.
  4. Welding details using standard ANSI/AWS 2.4 symbols and showing type, electrode, length, spacing and thickness of welds.
  5. Materials listing and properties, including types, strengths and finishes of concrete, masonry, metals, wood, plastics and other construction materials.
- H. Shop drawings for replacement items shall include field measurements needed to verify fit in existing spaces.
- I. Catalog data shall clearly indicate applicable items when several products are covered on one page. Using black ink, indicate on submitted catalog data, specification section or plan reference being satisfied.
- J. Installation or application instructions shall be Manufacturer's printed instructions including warranty requirements, clearances required and proper field procedures to deliver, handle, install and prepare product for use. In the absence of Manufacturer's published literature, ASTM, AWWA or trade standards for proper installation will usually be accepted. If no instructions at all are submitted for installing or applying an item of Work, Owner reserves right to stop work on subject item at any time, and to retain experts of Owner's choosing to prepare appropriate installation or application instructions to control Contractor's work. Installation instructions shall include recommended bolt torques for assembly and installation of bolted items.
- K. Operation and maintenance instructions shall be Manufacturer's printed instructions for correct operation and maintenance procedures for product, along with data which must accompany manual as directed by current regulations of government agency. Include operating instructions for each piece of equipment. Describe equipment function, operating characteristics, limiting conditions, operating instructions, startup procedures, normal and emergency conditions, regulation and control, and shutdown. Include preventative maintenance instructions. List warranty requirements. Explain and illustrate preventative maintenance tasks. Include lubrication charts, lists of acceptable lubricants, trouble shooting instructions, and lists of required maintenance tools and equipment. List recommended spare parts, their costs, and ordering information for one Manufacturer who can supply these parts. Index instructions for easy reference. Include information for installed equipment only.
- L. Certificate of compliance shall certify materials or procedures have been sampled, tested and found to comply with applicable reference standards, and shall be accepted by Owner prior to shipping items described therein.
- M. Engineering calculations shall be clearly legible, shall follow recognized engineering principles and shall be sufficiently detailed to permit ready check of procedures used. Where published tables or charts are included in calculations, clearly show design or load variables used to make selection, highlighting applicable columns or rows in tables and highlighting intersecting variables on chart axes. Engineering calculations shall demonstrate compliance with current state and local codes, applicable standards, and contract requirements. Calculations shall be sealed by a registered engineer licensed in State of California. Calculations or drawings bearing seals with expired expiration dates will not be accepted.

- N. Foundry or test record transcripts shall fully describe required tests in accordance with specified test standards, shall certify that factory quality control, testing and inspection requirements have been successfully completed and shall be accepted by Owner prior to shipping items described therein.
- O. Statements of Qualifications for optional maintenance contracts from Manufacturers or suppliers of products shall fully describe Manufacturer's qualifications, experience, pricing, and recommended maintenance schedule. Contractor's submittal of Manufacturer's qualifications for optional maintenance contracts shall not be construed as placing maintenance service contracts within scope of this contract except that Contractor may be obligated to pay for maintenance contract in event that:
1. Contract Documents expressly state Contractor shall bear this responsibility and expense under warranty or other express obligations, or
  2. Acceptance of a Manufacturer as an accepted equal is predicated in writing on Contractor's furnishing operation and maintenance services for a stipulated period as part of warranty requirement.
- P. Owner's Representative's review of submittals shall be limited to review of products to be incorporated in Work and to remain in place upon project completion. Contractor shall have sole responsibility at all times for construction means, methods and jobsite safety. Contractor shall retain services of California-licensed civil, structural or traffic engineer, as appropriate, to design and prepare plans for necessary safety equipment required by OSHA, Cal OSHA and other state and local regulatory authorities during construction, and to prepare summary documents for Contractor's use for accomplishing said work including, but not limited to sheeting, shoring, trench plating, excavation protection, falsework, formwork, scaffolding, barricading, pedestrian safety and traffic control. Originals of summary documents, signed and sealed by engineer of record who prepared them, shall be submitted solely as proof this requirement has been fulfilled. Since Contractor has sole responsibility for means, methods and jobsite safety, review of said documents will be limited to verifying preparing engineer's registration is current and that engineer of record has no active complaints filed against them with California Board for Professional Engineers and Land Surveyors.
- Q. Use of contract drawing reproductions for shop drawings is subject to rejection.

## **1.7 Samples**

- A. Furnish samples, finished as specified, and as intended to be used on or in Work. Send samples to Owner's Representative, carriage prepaid.
- B. Submit samples at least 21 days before date by which Owner's approval is required. Allow at least 14 days for review and return of samples.
- C. Submit 2 of each sample, except for field samples. Attach completed Contractor's submittal form to sample. List items being transmitted, stating proposed use and location, product, color, trade name, lot, style, and model as appropriate.
- D. Resubmit samples until acceptable. One of each sample will be returned to Contractor upon acceptance.

- E. Samples of finishes shall be 8" x 10". and shall be of minimum thickness consistent with sample presentation. In lieu thereof, submit actual full-size item.
- F. Samples of value may be returned to Contractor for use in Work after review, analysis, comparison, and/or testing as may be required by Owner's Representative.
- G. Furnish one sample of accepted products, colors, or textures to Owner's Representative for final record. Show identification previously described including, if finish sample, Manufacturer, mix proportion, name of color, building, Contractor, subcontractor, and surfaces to which applied on back of sample.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**

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# SUBMITTAL TRANSMITTAL FORM

FROM: \_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

PROJECT NO.: \_\_\_\_\_

\_\_\_\_\_

OWNER: \_\_\_\_\_

ATTN: \_\_\_\_\_

Construction Manager

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

SUBMITTAL NO.: \_\_\_\_\_

THIS IS AN ORIGINAL  
SUBMITTAL \_\_\_\_\_

THIS IS A REVISION  
OF SUBMITTAL NO.: \_\_\_\_\_

SUBJECT OF SUBMITTAL: \_\_\_\_\_

SPECIFICATION SECTION(S): \_\_\_\_\_

PLAN SHEET NUMBER(S): \_\_\_\_\_

CONTRACTOR'S CERTIFICATION: Check & Complete either (A) or (B) below:

(A) We have reviewed in detail and certify that material, equipment or construction procedure(s) contained in this submittal meet all requirements specified in or shown on Contract Documents, Construction Specifications and Drawings with no exceptions.

(B) We have reviewed in detail and certify that material, equipment or construction procedure(s) contained in this submittal meet all requirements specified in or shown on Contract Documents, Construction Specifications and Drawings except for the following deviations:

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

CONTRACTOR'S AUTHORIZED SIGNATURE:

\_\_\_\_\_

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**SECTION 01400  
QUALITY REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Inspection and testing laboratory qualifications, duties and responsibilities, Contractor's quality control requirements, Owner's inspection and testing.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01750: Starting and Adjusting

**1.3 Reference Standards**

- A. Work shall conform to Federal, State and local building codes, electrical codes, fire codes, mechanical codes and plumbing codes, and to Occupational Safety and Health Act (OSHA) Regulations. Nothing in Contract Documents shall be interpreted as permission or direction to violate any governing code or ordinance.
- B. Where reference is made to third-party standards such as ANSI, AWWA or ASTM specifications, or any standard or code adopted or promulgated by a public agency, it shall mean latest edition thereof formally adopted and published at time of advertisement for bids.

**1.4 Quality Assurance**

- A. Upon completion of Contract, Work shall be finished, tested and ready for operation. Work shall fulfill its intended purpose as described in Contract Documents, in submittals, and in Manufacturer's literature.
- B. Only competent workers shall be employed on Work. Any person employed who is found to be incompetent, intemperate, troublesome, disorderly, or otherwise objectionable or who fails to perform work properly, acceptably and in accordance with Manufacturers' installation and warranty requirements, shall be immediately removed from Work by Contractor and not reemployed on Work.
- C. Welders shall be AWS certified for type of work they are performing.
- D. Welders on steel pressure piping or tank work shall be AWS certified as boiler and pressure vessel welders per Section IX Part A of AWS B2.1 as required by AWWA C200 paragraph 3.3.3.1.
- E. Fabricators shall have five years minimum experience in appropriate area of specialty and shall be accepted by Owner.
- F. Testing Agencies shall have five years minimum experience in appropriate area of specialty and shall be accepted by Owner.
- G. Manufacturer's production facilities shall be open for inspection by Owner or Owner's Representative at all times during production of products furnished under this contract.

- H. Notify Owner's Representative of time and place of shop tests no later than 14 calendar days before they begin. Complete manufacturing operations, checks, adjustments and tests before factory inspection.
- I. Notify Owner's Representative promptly if scheduled test or inspection must be cancelled or rescheduled. Owner will back-charge Contractor for costs incurred by Owner due to Contractor's failure to notify Owner's Representative of scheduling, rescheduling or cancellation of tests and inspections in a prompt and timely manner.
- J. Factory witnessed tests, where required shall be completed no sooner than 14 calendar days after written notification is delivered to Owner. Owner will pay travel expenses for Owner's personnel to and from laboratory performance test location within 50 miles of Work for first test only. Should test results indicate, in opinion of Owner's Representative, that tested equipment fails to meet specified requirements, Owner's Representative will notify Contractor of performance test failure. Contractor shall thereupon notify Manufacturer to reschedule testing and notify Owner of time of retest. Manufacturer shall thereupon at no expense to Owner, make modifications and perform tests as required to demonstrate compliance with Specifications. Additional costs for job specific travel and subsistence shall be reimbursed to Owner by Contractor.

**1.5 Submittals**

- A. Furnish following submittals.

SUBMITTAL	DESCRIPTION	
Certificates of Compliance	Furnish on Owner's Request	.
Transcripts of Acceptance Test Results	Furnish on Owner's Request as needed to verify quality of manufactured products	

- B. Furnish samples as required for testing. Cost of material samples to be tested shall be paid by Contractor in all cases. Cost of testing, sampling and laboratory services shall be paid for by Owner or Contractor as shown.

**1.6 Testing Laboratory Services**

- A. Where required by these specifications, or where tests occur more than 50 miles from Work, Contractor shall hire an Owner-accepted independent laboratory to perform testing and certify results. Provide labor, products, tools, instruments, water, and power as directed for sampling for required tests.
- B. Samples for testing shall be representative of final work product. Samples treated differently from final work product will not yield valid test results.
- C. Tests of products shall follow commonly recognized standards of national technical organizations, and specified sampling and testing methods.
- D. Contractor shall pay for quality assurance testing unless otherwise shown.
- E. Retest costs or other testing costs invoiced to Owner and specified to be paid by Contractor may be deducted from Contractor's next progress payment in lieu of Contractor's direct payment of invoice.
- F. Owner may test representative samples of each type and size of product furnished using an independent testing agency. Failure of samples to pass tests will be deemed sufficient cause to reject entire lot delivered.

## **1.7 Contractor's Quality Control**

- A. Arrange work to be readily accessible and easy to operate and maintain where detail drawings are not included in Contract Documents, supplementary drawings or shop drawings and submittals.
- B. Combinations of manufactured equipment shall be fully compatible and work safely and successfully as a unit. Furnish necessary mountings, couplings and appurtenances with each unit.
- C. Relocations or adjustment of existing facilities noted in Contract Documents shall be done as needed. If existing items are lost or damaged during construction, replace with new items of equal or better quality.

## **1.8 Project Conditions**

- A. Ascertain suitability of native soil for backfill before submitting bid. If native soil is found to be unsuitable, provide suitable material for meeting compaction requirements at no additional cost to Owner.
- B. Items furnished shall be capable of fulfilling their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.

## **PART 2 - PRODUCTS (Not Applicable)**

## **PART 3 - EXECUTION**

### **3.1 Inspection**

- A. Products and Work shall be subject to field and factory inspection and testing in accordance with standards required and defined in Contract Documents. Waiver by Owner of their right to inspect shall not relieve Contractor of duties to comply with Contract Documents.
- B. Contractor shall provide and pay for independent inspection, deputy inspection and testing services required by Contract Documents.
- C. Owner will provide certain inspection and testing duties not required of Contractor under Contract Documents. Performance of these tests and costs will be borne by Owner; except, Contractor shall pay cost of any failing test.
- D. Inspection will be provided by Owner's Representative. Inspection shall not be considered as direct control of individual workman and his work. Inspections, tests, or approvals by Owner's Representative or others shall not relieve Contractor from their duty to perform Work in accordance with Contract Documents.
- E. Inspection and testing fees imposed by public agencies other than Owner shall be paid for by Contractor. If Contract Documents, permits, laws, ordinances, rules, regulations or orders of public authorities having jurisdiction require Work to be inspected, tested, or accepted by someone other than Contractor, give Owner's Representative timely notice of readiness. Submit required certificates of inspection, testing or approval to Owner's Representative.

- F. Maintain access to Work for Owner and Owner's Representatives. Permit authorized representatives and agents of Federal or State agencies to inspect work, products, and other relevant data and records. Provide safe and proper facilities to access and observe Work and to inspect or perform tests.
- G. Owner's Representative will inspect products after delivery and throughout construction process. Products will be subject to rejection at any time on account of failure to meet Contract Documents even though samples may have been accepted as satisfactory at place of manufacture.
- H. Before backfilling, request inspection by Owner's Representative to verify proper installation of buried work.
- I. Before finishing, request inspection by Owner's Representative to verify no surfaces to receive product have defects or errors which could result in poor or potentially defective application or cause latent defects in workmanship.
- J. If Work is covered contrary to written instructions or work is covered before Contractor requests and receives inspection, uncover it at Contractor's expense, if requested by Owner's Representative. Replace at Contractor's expense.
- K. If Owner's Representative considers it advisable covered Work be reinspected or tested by others, at Owner's Representative's written request, uncover Work in question, furnishing necessary labor, products, and tools. If Work is found defective, Contractor shall pay for uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If Work is not found defective, Contractor will be allowed an increase in Contract Price or an extension of Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction, and a Change Order will be issued.

### **3.2 Field Quality Control**

- A. Frequency of sampling and testing shall be as shown, and shall be performed at such other times as necessary to document contract compliance.
- B. Notify Owner's Representative and regulating authorities three days before field tests.
- C. Perform field tests in presence of Owner's Representative who will record results.
- D. Pipework, valves, fittings, conduit, tanks and appurtenances shall have no leaks at design pressures. Joints shall be watertight.
- E. Buried pipework and conduit shall provide a clear and unobstructed pathway free from obstructions due to pipe or conduit deflection and free from interior debris. Where Owner has reason to suspect presence of such obstructions, Owner's Representative reserves right to require mandrel testing to demonstrate compliance before subsequent work such as paving, before charging or commissioning of piping, or before installation of wire within conduit.
- F. Remove rejected work from jobsite. Work rejected by Owner's Representative for failure to comply with Contract Documents, shall be removed within 10 calendar days after Written Notice of rejection, whether incorporated in Work or not, unless repairs have been made to Owner's satisfaction.
- G. Promptly replace and reexecute removed Work in accordance with Contract Documents and without expense to Owner. Contractor shall bear cost of making good Work of other Contractors destroyed or damaged by such removal or replacement.

- H. Removal and replacement work shall be at Contractor's expense. If Contractor does not act to remove rejected Work within 10 calendar days after receipt of Written Notice, Owner may remove such Work and store products at Contractor's expense.
- I. Repair, correct or replace work failing tests or inspection. Repeat tests at Contractor's expense, until results satisfy specifications.
- J. Repair damage to work that is not cause for rejection.

**END OF SECTION**

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**SECTION 01500  
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Mobilization, storage yard, temporary utilities, security, access roads and parking areas, temporary controls and traffic regulation.

**1.2 Related Work**

- A. Section 01040: Coordination
- B. Section 01330: Submittal Procedures
- C. Section 01590: Field Offices and Sheds
- D. Section 01770: Closeout Procedures

**1.3 Submittals**

- A. Storage yard description shall describe Contractor's proposed methods for dust and noise control in storage areas to satisfaction of Owner.
- B. Plan for drawing water from Lake Berryessa, including access route, pumping equipment, and erosion control.

**1.4 Mobilization**

- A. Obtain temporary easements, which Contractor may require for construction activities outside of existing easements and/or rights of way secured by Owner, at Contractor's expense.
- B. When using vacant property to park and service and store products, obtain approval from Owner's Representative and permit from City or County Planning Department. Notify adjacent property owners of this proposed use. Obtain written approval from property owner stating requirements which are a condition of this approval.
- C. Remove obstructions in right-of-way before starting construction. Where private property, such as parked cars, must be removed prior to construction, notify respective property owners 72 hours in advance of right of way clearing to allow them to remove their property.

**1.5 Temporary Utilities**

- A. Construction power shall be purchased or generated on-site by Contractor for constructing Work. After electric service is re-established arrange for payment of all electrical costs for duration of project. Change payment to Owner after Substantial Completion of all Work.
- B. Construction water shall be clean and free from objectionable deleterious amounts of acids, alkalies, salts, or organic materials. Contractor shall, at his expense, arrange to develop water sources, provide backflow protection and supply labor and equipment to collect, load, transport, and apply water as needed for compaction, testing, concrete work, dust control dust, and other construction use.
  - a. Contractor shall not draw water from any fire hydrant, except to extinguish a fire, without obtaining permission from applicable water utility.
  - b. Contractor shall not use the new onsite well for construction water.

- c. Contractor shall not draw water from Lake Berryessa without written approval from Owner and Bureau of Reclamation. Submit a plan showing access, pumping equipment, and erosion control for approval prior to drawing water from lake.
- C. Provide safe drinking water and toilet and sanitation facilities on jobsite at all times. Toilets shall be cleaned at least once per week. Do not allow personnel to use bathroom or shower facilities constructed as part of Work.
- D. No landline telephone service is available at Site. Contractor shall maintain cell phone access for contact of onsite personnel by Owner.
- E. Do not use propane from new propane system, except as needed for testing and startup. After Substantial Completion, arrange and pay for filling of propane tank.

## **1.6 Construction Aids**

- A. Provide scaffolding, rigging, hoisting and services needed to safely deliver and install products. Remove same from premises when installation is complete.

## **1.7 Access Roads and Parking Areas**

- A. Do not construct access or haul roads. Use existing roads and new trail routes as required for project, and personnel movement into and within construction area, subject to prior approval by Owner.
  - a. If existing roads that are to remain are utilized, provide improvements to those roads after completion of construction activities.
  - b. If existing roads that are to be abandoned are utilized, scarify and hydroseed roads after completion of construction activities.
  - c. If trail routes are utilized, provide improvements to trails after completion of construction activities.
- B. Treat access roads and parking areas as needed to control dust and prevent tracking of mud onto paved streets.

## **1.8 Temporary Controls**

- A. Dust control operations shall prevent construction dust from harming property or annoying persons adjacent to Work. Use water or dust preventative to control dust. Cover or wet loads of excavated material or rubbish leaving site or of material being imported to prevent blowing dust.
- B. Noise control shall be done to comply with local noise ordinances and OSHA regulations for acceptable noise exposure. Schedule Work to comply with noise ordinances. Install sound barriers if needed to comply with noise ordinances and Contract Documents. If noise at doorstep of any private residence exceeds allowable noise specified, Owner may require Contractor to pay each affected household \$200 per day to cover expenses of alternative lodging.
- C. Fire danger shall be minimized at and near construction site. Protect surrounding private property from fire damage resulting from construction operations.
- D. Storm water management operations shall be conducted and maintained as needed to prevent runoff or seepage from entering excavations and to control erosion in conformance with Federal, State and local regulations.



**1.9 Traffic Regulation**

- A. Contractor shall implement whatever traffic control measures may be required to facilitate Work of this contract, at no additional cost to Owner.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**

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**SECTION 01510  
EROSION CONTROL TREATMENT**

**PART 1 - GENERAL REQUIREMENTS**

**1.1 Description**

Erosion control and landscaping work shall consist of performance of all operations and furnishing of all labor, materials, tools, and equipment necessary to complete all soil preparation, finished grading, weed control, planting, watering, plant establishment and maintenance, and incidental work which may be required and as shown on Drawings and as described hereinafter.

**1.2 Related Work Described Elsewhere (not applicable)**

**1.3 Submittals**

- A. Hydrospraying materials and application equipment to be used.
- B. Excelsior Matting
- C. Amendments and Fertilizers
- D. Fiber Rolls

**PART 2 - MATERIALS**

**2.1 Hydrospraying**

- A. Erosion Control Seed Mix

Erosion Control Seed Mix	
Cellulose fiber mulch.....	2,000 lbs/acre
CRF fertilizer Agriform 16-7-12 (plus iron).....	500 lbs/acre
0-18-0 single superphosphate .....	200 lbs/acre
Agricultural gypsum.....	500 lbs/acre
Soil sulfur .....	50 lbs/acre
Seed mix, .....	refer to erosion control details on Drawings

- B. Cellulose Fiber Mulch

Cellulose fiber mulch shall consist of clean, natural wood cellulose fiber which is dyed green and contains no growth or germinating inhibiting elements. Cellulose fiber mulch shall be tested and certified that it meets these requirements. Weight of this material refers only to air-dry weight which shall be clearly marked on package.

All CRF fertilizer shall be controlled release fertilizer utilizing resin coated prills with an analysis of 16-7-12 (plus iron).

- C. Stabilizer

Soil stabilizing agent shall be a polymer emulsion consisting of at least 95% to 97% liquid acrylic. Acrylic emulsion shall be easily dispersed in water.

The concentrate shall include constituents to assist penetration of compound into earth as well as an ultra-violet absorbing agent to provide additional longevity. Compound shall

contain an anti-foaming agent, allowing seeds to be mixed within a hydraulic applying device without prohibitive foam. When compound is mixed with water and applied to soil, it shall not change pH factor of soil more than one pH unit. Compound shall contain a self-disappearing color additive which will assist applicator in uniform application of product after mixing with water.

The stabilizing agent shall be readily miscible in water, non-injurious to seed or animal life, non-offensive in odor or handling by humans, non-flammable, and capable of providing surface stabilization in various soil classifications without totally inhibiting water infiltration. Material shall air cure in 48 hours under normal conditions and have a characteristic of being completely transparent after drying and have an effective life in excess of two years.

All materials shall be delivered to Site in unopened containers (drums) and all containers shall remain tightly closed until used.

## **2.2 Excelsior Matting**

### **A. Excelsior Blanket**

The excelsior blanket shall consist of a machine produced mat of curled wood excelsior of 80%, 6-inch or longer fiber length, with consistent thickness and fiber evenly distributed over entire area of blanket. Fiber dimensions shall be 0.21" x 0.42" □ 25%. Average weight per square yard to be .08 pounds □ 10% at time of manufacture.

The top side of each blanket shall be covered with biodegradable extruded plastic mesh. Blanket shall be made smolder resistant without use of chemical additives.

### **B. Staples**

The staples shall be made of wire, .091-inches in diameter or greater, "U" shaped with legs 6-inches in length and a 1-inch crown. Size and gauge of staples used will vary with soil conditions.

The staples shall be driven vertically into ground, spaced approximately 2 lineal yards apart, on each side, and one row in center alternately spaced between each side (60 staples on each blanket). Use a common row of staples on adjoining blankets.

## **PART 3 - EXECUTION**

### **3.1 General**

#### **A. Excelsior Matting**

The area to be covered shall be prepared, fertilized, and seeded before blanket is applied. When blanket is unrolled, netting shall be on top and fibers in contact with soil over entire area. In ditches blankets shall be applied in direction of flow of water, butted snugly at ends and side and stapled.

#### **B. Hydrospraying**

##### **1. General**

Method of temporary irrigation shall be approved by Owner's Representative prior to hydrospraying.

The hydrospray shall be applied in form of a slurry consisting of cellulose fiber, seed stabilizer additives, commercial fertilizer, and water. When hydraulically sprayed on soil surface, mix shall form a blotter-like ground cover impregnated uniformly with seed and fertilizer and shall allow moisture to percolate to underlying soil.

2. Stabilizer

The soil stabilizing agent shall be applied at rate of 60 gallons concentrate mixed with 1,500 gallons of water per acre.

3. Equipment

Hydraulic equipment used for application of slurry shall be a 1,500-gallon capacity agitator-mixer. This equipment shall have a built-in agitation system and operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing not less than 40 pounds of cellulose fiber mulch, plus a combined total of 7 pounds of fertilizer solids for each 100 gallons of water.

The slurry distribution hose lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic spray nozzles which will be mounted on a traveling unit. Agitator-mixer may be either self-propelled or drawn by a separate unit which will place slurry tank and spray nozzles within close proximity to areas to be hydrosprayed.

4. Preparation

Slurry preparation shall take place at site of work and shall begin by adding water to tank when engine is at half throttle. When water level has reached height of agitator shaft, good recirculation shall be established. At this time, seed shall be added. Fertilizer shall then be added followed by cellulose fiber mulch. Wood pulp shall only be added to mixture after seed and when tank is at least one-third filled with water. Engine throttle shall be opened to full speed when tank is half filled with water. Cellulose fiber mulch shall be added by the time tank is two-thirds to three-fourths full. Spraying shall commence immediately when tank is full.

5. Application

The operator shall spray area with a uniform, visible coat by using green color of cellulose fiber as a guide. Slurry shall be applied in a sweeping, arched stream so as to fall like rain, allowing cellulose fibers to build on one another until a good coating is achieved and material is spread at required rate per acre.

6. Time Limit

All slurry mixture which has not been applied within four hours after mixing shall be rejected and immediately removed from Site by Contractor.

7. Protection

Special care should be exercised by Contractor in preventing slurry from being sprayed outside designated area. Any slurry spilled into restricted areas shall be cleaned up by Contractor to satisfaction of Owner's Representative.

**END OF SECTION**

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**SECTION 01610  
PRODUCT REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Basic requirements for all products used in Work.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01400: Quality Requirements
- C. Section 01650: Product Delivery, Storage and Handling Requirements
- D. Section 01700: Execution Requirements
- E. Section 01770: Closeout Procedures
- F. Section 16010: General Electrical Requirements

**1.3 Quality Assurance**

- A. If products are furnished which differ from those shown and which require changes to enclosures, mounting and support structures, power and control circuitry or other Work to accommodate furnished product, provide changes required at no additional cost to Owner and of same quality as shown.
- B. Piping systems and elements shall comply with ASME Codes, and appropriate ASTM, API, AWWA, or NFPA standards.
- C. Products requiring electrical connection shall be listed and classified by Underwriters Laboratories, Inc. as suitable for purpose shown.
- D. Wiring terminations shall match branch circuit conductor quantities, sizes, and materials shown. Enclose terminal lugs in terminal box sized to NFPA 70.
- E. If products are furnished which differ from those shown and which require changes to enclosures, mounting and support structures, power and control circuitry or other Work to accommodate furnished product, provide changes required at no additional cost to Owner and of same quality as shown.

**PART 2 - PRODUCTS**

**2.1 Acceptable Manufacturers**

- A. Products of listed acceptable Manufacturers shall meet Specifications notwithstanding the fact Manufacturer is "listed". Owner reserves right to reject submittals and products from "acceptable Manufacturers" if they fail to demonstrate compliance with Specifications.
- B. Similar items on project shall be products of same Manufacturer.
- C. Equipment furnished shall operate through its full operating range powered by amperages specified or shown on Drawings. Equipment requiring larger amperage than specified or shown is unacceptable without written statement from Owner that electrical infrastructure and switchgear can support increased amperage.

## 2.2 Materials

- A. Products shall be new and of current design and manufacture, free from defects and imperfection that might affect serviceability of product for its intended purpose.
- B. Products and workmanship shall match Contractor's submittals as reviewed by Owner's Representative.
- C. Products or Work for which no technical specifications are set forth shall be of best grade in quality and workmanship obtainable in market from firms of established good reputation, or, if not ordinarily stocked, shall conform to usual standards for first class products of kind required, considering intended use. Work shall be in full conformity and harmony with intent to secure best standard of products and construction.
- D. Notify Owner's Representative in writing at least 15 calendar days before testing of materials is required. Written notice shall include name of supplier along with contact information, address and telephone number for source of material.
- E. Materials and materials sources shall be accepted by Owner at least three days before use of materials in Work.
- F. Dissimilar metals, when used in conjunction with each other shall have suitable insulation provided between adjoining surfaces to eliminate direct contact and resultant current.
- G. Insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators, bushings, washers, or other accepted materials.
- H. All-thread or close nipples are prohibited.
- I. Mating ends of pipe shall match.
- J. Mating ends of valves, meters and couplings shall match ends of adjacent pipe.
- K. Minimum working pressure of valves, couplings and fittings shall equal or exceed class of pipe to which they are attached or 150 psi, whichever is higher.
- L. Castings shall be sound, clean, free from porosity, cold shots, blisters, holes and defects of any nature that would render them unacceptable. No plugging, filling, brazing or welding of defects will be allowed.
- M. Connections and mountings required to install products shall comply with connections and mountings shown in Contract Documents and Submittals on location-specific basis. Do not assume approval of connections or mountings at one location constitutes approval of same at all locations.
- N. Conform to federal, state and local regulations governing VOC content, lead content, percentage solids by volume, and other paint and solvent properties.
- O. Corresponding parts of identical products shall be interchangeable.
- P. Materials for complete paint or sealant system, including primer, finish coats, thinners, cleaners and drying agents, and other additives shall be end products of one Manufacturer to ensure product compatibility and unit responsibility.



- Q. Design and fabrication of products shall ensure products withstand stresses and loads which may occur during testing, installation, start-up, and normal operation.
- R. Products shall be capable of fulfilling their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.
- S. Electrical equipment shall be built to NEMA and UL standards for NEC Article 505 Classification specified

### **2.3 Equipment**

- A. Stainless steel inscribed nameplates shall be securely fastened in conspicuous locations for mechanical equipment having moving parts. Show Manufacturer's name, year of manufacture, serial number, principal rating data and equipment item number. Nameplates shall be in English and use American measuring units.
- B. Valves shall be marked to show name of Manufacturer, year of manufacture, size of valve, maximum working pressure, and arrow to show direction of flow.
- C. Valves shall close drip tight at rated pressures.
- D. Valves shall be satisfactory for applications involving valve operation after long periods of inactivity.
- E. Grease fittings shall be standard button-head type. Grease fittings shall be serviceable by a single type of grease gun. Extend fittings as necessary to provide easy access, or as directed by Owner's Representative.
- F. Furnish special tools, wrenches and appliances needed to adjust, operate, maintain or repair mechanical equipment supplied.

## **PART 3 - EXECUTION**

### **3.1 Installation**

- A. Furnish mounts, guides, bearing plates, flanges, anchor and attachment bolts and screws, saddles, supports, pads and skids necessary to securely mount products and equipment.
- B. Tighten bolts to Manufacturers' specifications using torque wrenches. Unless otherwise directed, use lubricant such as Copperkote or blue Teflon when making up bolts.
- C. Manufacturer's instructions and warranty requirements for installation, application, connection, erection, maintenance, operating, cleaning and conditioning of products shall be strictly followed.
- D. Contractor shall require Manufacturers to furnish technical representative to visit Site as needed to provide technical support in resolving field problems associated with Manufacturer's product.

**END OF SECTION**

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**SECTION 01640**  
**INSTALLATION OF OWNER-FURNISHED PRODUCTS**

Note: At this time (Oct 10, 2013), no Owner-Furnished products are planned. This section will be removed at final submittal unless this status changes for Owner supplied tables, signs, etc.

**PART 1 - GENERAL**

**1.1 Work Included**

- A. This section includes delivery, storage, handling, installation and startup of Owner-furnished products.
- B. Owner furnished products for this job include following:
  - 1. Package water booster station.

**1.2 Related Work**

- A. Section 01650: Product Delivery, Storage and Handling Requirements
- B. Section 01700: Execution Requirements

**1.4 Quality Assurance**

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Handle, store and install owner-furnished products in accordance with Manufacturer's printed instructions and warranty requirements for storage, handling and installation of Manufacturer's products.

**1.5 Submittals**

- A. Copies of shop drawings and other submittals will be forwarded to Contractor by Manufacturer. Review shop drawings and verify adequate space is provided for installation of Owner-furnished items. In event adequate space or utility connections are not available, immediately notify Owner's Representative in writing so appropriate arrangements may be made.
- B. Contractor shall request, review and comply with Manufacturer's written instructions and warranty requirements for handling, storing and installing Manufacturer's products. In the event compliance with said instructions is not feasible, Contractor shall notify Owner's Representative in writing of any exceptions taken to said installation instructions and Owner will take appropriate action.

**1.6 Delivery, Storage and Handling**

- A. Refer to Section 01650 for delivery storage and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of products shall be strictly followed.
- C. Coordinate with Manufacturer and Owner as required to receive, inspect and properly store Owner-furnished products.

- D. Upon receipt of Owner-furnished items, thoroughly inspect and inventory delivered item preparing full listing of any noticeable defects or flaws. Submit photograph or videotape evidence of said defects to Owner's Representative.

## **PART 2 - MATERIALS**

### **2.1 Materials**

- A. Furnish incidental bolts, nuts, screws, fasteners, anchors, couplings, supports, pipe couplings, junction boxes, electrical connections, grout and other work required to properly mount, set, level and connect owner furnished items to other facilities being constructed as part of this Contract.

## **PART 3 - EXECUTION**

### **3.1 Preparation**

- A. Make field measurements needed to install Owner-furnished items. Field conditions which limit Contractor's ability to properly install said items shall be brought to attention of Owner's Representative at earliest possible moment. Make minor changes in dimensions and alignments as needed to accommodate dimensions of Owner-furnished items as shown in shop drawings.

### **3.2 Installation**

- A. Install owner supplied equipment at locations shown on Drawings according to Manufacturer's installation and warranty requirements. Manufacturer's requirements for installation, application, connection, erection, maintenance, operating, cleaning, conditioning, and startup of products shall be strictly followed.
- B. Install owner supplied equipment to tolerances recommended by Manufacturer. Unless otherwise shown, install equipment true, plumb, and level, using precision gauges and levels.
- C. Refer variances between Manufacturer's installation instructions and Contract Documents to Owner's Representative.

### **3.3 Field Quality Control**

- A. Manufacturer of Owner-furnished products will perform field inspection of installed facility prior to completion of Work. Any exceptions to installation will be brought to Owner's attention by Manufacturer at time of Manufacturer's field inspection so Owner and Contractor may take appropriate remedial actions.
- B. Contractor shall make modifications to installation as requested by Manufacturer to remedy any conditions identified by Manufacturer which might void Manufacturer's warranty.

**END OF SECTION**

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**SECTION 01650**  
**PRODUCT DELIVERY STORAGE AND HANDLING REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Transportation and handling, storage and protection of products.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01400: Quality Requirements
- C. Section 01610: Product Requirements

**1.3 References**

**1.4 Delivery, Storage and Handling**

- A. Before shipping materials and/or equipment, Contractor shall also be responsible for verification of field dimensions, utility locations and electrical compatibility for items of Work which may require relocation, refitting, or different electrical motors and wiring if field dimensions differ from those shown on Drawings.
- B. In the event Contractor discovers a conflict during surveying, staking, verification of field dimensions, verification of utility locations or verification of electrical compatibility, they shall bring this matter to Owner's attention as soon as conflict is discovered and before materials or equipment are shipped. Owner will make adjustments to Contract requirements needed to accommodate field conditions, and will pay reasonable costs for upgrades or modifications required to be made at place of manufacture prior to shipping to accommodate conflicts discovered.
- C. Owner will not pay costs of shipping and returning items to place of manufacture unless:
  - 1. Owner has acted to prevent Contractor from completing surveys, staking, verification of field dimensions, verification of utility locations or verification of electrical compatibility, and Contractor has notified Owner of this fact in writing before shipping equipment, or
  - 2. Changes required are a direct result of buried utility conflicts where said utilities were neither shown on Drawings in their approximate location, nor located by Underground Service Alert nor evident from surface features.
- D. Ship and deliver products to jobsite as follows:
  - 1. Do not ship, accept delivery of or store items on Site for which applicable submittals have not been accepted.
  - 2. Before shipping, operate valves, motors, pumps, actuators, and mechanical equipment at factory to ensure products are complete and in working condition.
  - 3. Only products of accepted manufacturers shall be delivered to or stored at Site.

4. Deliver products to jobsite in Manufacturer's original, unbroken, unopened, labeled packaging containers or bundles. Tag or label packages containers or bundles as needed to identify contents and name of equipment of which contents form a part.
5. Deliver large multi-component assemblies in sections that facilitate field handling and installation.
6. Oil-lubricated gearing, bearings, and other lubricated components shall be shipped with oil soluble protective coating as described in warranty requirements or recommended by Manufacturer. For parts contacting potable water, coating shall be NSF-approved. Coating shall provide protection for one year after final acceptance.

E. Store products at jobsite as follows:

1. Store materials per Manufacturer's recommendations, and in protected area at temperature between 35°F and 110°F.
2. Store products so as to preserve their quality and fitness for Work. Locate stored products and equipment to be incorporated in Work to facilitate prompt inspection. Contractor shall be responsible for damage or loss to products until Final Acceptance.
3. Protect products against moisture, weather, temperature extremes, dust, debris, tampering, theft, vandalism, ultraviolet radiation, or damage from improper handling, storage, or exposure.
4. Protect exposed metals from rust and corrosion, even for items which may be sandblasted or otherwise cleaned before painting. Any corrosion in evidence prior to final acceptance shall be removed, or product shall be removed or replaced.
5. Store items not designed for outdoor exposure off-ground and under cover.
6. Store aggregate in well-drained area to minimize change in moisture content. Prevent contamination by other materials.
7. Store cementitious materials in weather-tight spaces. Keep free from moisture.
8. Store fasteners and connectors in original unopened containers until used.
9. Cover stored materials with tarpaulin or other covering to prevent soiling or exposure to weather. Fasten coverings to prevent removal by wind
10. Cover plastic and similar brittle items to protect from sun exposure and temperature extremes.
11. Store flammable products to conform with City, County, State, and Federal safety codes for storage of flammable materials.
12. Cover, plug, or cap pipe ends, valve ends, and equipment openings with rubber, plastic, or canvas to prevent intrusion or contamination.
13. Store items in accordance with requirements of Project Storm Water Pollution Prevention Plan (SWPPP), if applicable. If a SWPPP has not been prepared for Project, store items in accordance with appropriate best management practices (BMP's) listed in California Stormwater Quality Association (CASQA) Stormwater

Best Management Practice Handbook for Construction latest edition. Comply with all City, County, State and Federal pollution prevention laws and permits.

14. Notify Owner in writing if delivered or stored product is damaged. Exterior surfaces of delivered items shall be in perfect unblemished condition. Do not repair damaged products without prior written approval.

F. Handle products as follows:

1. Handle products with care, using proper equipment according to Manufacturer's recommendations. Lift large heavy items only at points designated by Manufacturer. Do not drop, drag, bump, bend or handle products in manner that causes abrasions, bruises, cracks, mars, scars, scratches, or other damage. Use padded slings and hooks for lifting as needed to prevent damage. Improper handling shall be cause to reject mishandled products.
2. Coated pipe, valves and other products shall be lifted, lowered or suspended using rubber or canvas belt slings or pneumatic-tired cradles. Sling width shall equal or exceed pipe or product diameter. Do not handle coated products using ropes, hooks, chains, calipers or cables. Store such materials on padded skids.
3. Inspect each product item for damage, defects, completeness and correct operation before installing.
4. Before installation, swab joints and interiors of piping materials to remove foreign matter and contaminants.
5. Clean and protect machined surfaces and shafting from corrosion using proper type and amount of coating as described in Manufacturer's warranty requirements to assure protection to one year after final acceptance.
6. Maintain records for Owner's review of deliveries to show Contractor's order number, purchase order number, and equipment number. Include labeling or shipping tag in records.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 Warranty Requirements**

- A. Manufacturer's instruction and warranty requirements for delivery, storage and handling of products shall be strictly followed.

**END OF SECTION**



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**SECTION 01700  
EXECUTION REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Examination of Site before bidding, preparation for construction, and execution of Work

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01400: Quality Requirements
- C. Section 01610: Product Requirements
- D. Section 01650: Product Delivery, Storage and Handling Requirements
- E. Section 01740: Cleaning, Final Cleaning, Pollution Prevention and Disposal of Hazardous Waste
- F. Section 01750: Starting and Adjusting
- G. Section 01770: Closeout Procedures
- H. Section 01787: Project Warranties
- I. Section 01820: Demonstration, Training and Spare Parts
- J. Section 16010: General Electrical Requirements

**1.3 Project/Site Conditions**

- A. Items furnished shall be capable of fulfilling their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.
- B. The action of beginning installation, application or erection of any product shall be deemed sufficient evidence that both Contractor and installer accept existing field conditions as acceptable for installation, application or erection of that product, except where written notice is given of Contractor or installer's concerns before starting applicable work.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 Preparation**

- A. Before beginning work, carefully and thoroughly document condition of Site and existing improvements using dated photographs or videos. Where existing cracks in concrete, masonry or other materials are wider than thickness of a dime, include a dime or similar visual standard in photo or video for reference.
- B. Submit copies of documentation to Owner's Representative before beginning work. Damage not documented as preexisting before start of construction will be attributed to Contractor's activities in absence of conclusive evidence to contrary.
- C. Carefully lay out work in advance to minimize cutting, channeling, chasing or drilling of structural pads or elements. Cuts, channeling, drilling, or welding required to accommodate mechanical or electrical equipment shall be reviewed in advance with Owner's Representative. Do not begin such work until notified by Owner's Representative. Repair

damage to structures, piping equipment or finishes using skilled workers of appropriate trades.

- D. Trimming of existing tree branches and roots required to accommodate construction activities shall be done under direction of a certified arborist.
- E. Make field measurements needed to fabricate and install Work before ordering or beginning work. Make minor changes in alignments and dimensions as needed to remedy or avoid utilities and structural conflicts.
- F. Material safety data sheets (MSDS) shall be available and maintained at Site.

### **3.2 Installation / Application / Erection**

- A. Maintain complete set of Contract Documents including shop drawings at Site field office or superintendent's truck at all times.
- B. Pursuant to Title 13 of California Code, Section 2449(d)(3), Contractor shall ensure all self-propelled diesel-fueled vehicles on Site, 25 horsepower and up and not designed for on-road driving, limit idling to no more than five consecutive minutes, with following exceptions:
  - 1. idling when queuing;
  - 2. idling to verify vehicle is in safe operating condition;
  - 3. idling for testing, servicing, repairing, or diagnostic purposes;
  - 4. idling necessary to accomplish work for which vehicle was designed (such as operating a crane)
  - 5. idling required to bring machine system to operating temperature; and
  - 6. idling necessary to ensure safe operation of vehicle.
- C. Contractor shall be responsible for promptly paying any fines assessed for noncompliance with Title 13 idling limitations for any equipment owned or rented by Contractor or his subcontractors.
- D. Install products in accordance with shop drawings and submittals.
- E. Install products according to Manufacturer's installation and warranty requirements. Manufacturer's requirements for installation, application, connection, erection, maintenance, operating, cleaning, conditioning and startup of products shall be strictly followed.
- F. Products shall be installed by Contractor at location shown on Drawings and submittals.
- G. Install products to tolerances recommended by Manufacturer. Unless otherwise shown, install equipment true and level, using precision gauges and levels.
- H. Refer variances between Manufacturer's installation instructions and Contract Documents to Owner's Representative.
- I. Construct walls, floors and flatwork plumb, straight, level, square and true. Acceptable deviations from plumb or level shall not exceed 1/4 inch in any 32 inch section. Flatwork shall not deviate from plan elevation by more than 3/4 inch at any location.

- J. Welds, unless otherwise shown, shall be continuous, watertight, and conforming to Structural Welding Code of American Welding Society. Welds shall be free of sharp points or edges.
- K. Before welding, abutting joints shall be free of strain.
- L. Exposed surfaces shall be finished in appearance. Grind smooth exposed welds. Round or chamfer corners of exposed structural shapes for personnel protection.
- M. Roofing systems shall be leak free, demonstrated by a 1-hour hose test.
- N. Prime and paint exposed surfaces of ferrous products, piping, and conduit except for stainless steel or galvanized or sherardized surfaces or unless otherwise shown. Clean painted surfaces and touch up bare or marred spots with finish to match factory finish.
- O. Paint and coat in workmanlike manner so as to produce an even film of uniform thickness. Pay attention to edges, angles, flanges, corners, crevices, and joints to insure that they have been thoroughly cleaned and that they receive specified thickness of paint or coating. Finished surfaces shall be free from runs, drops, ridges, waves, shiners, laps, brush marks, and variations in color, texture and finish. Hiding shall be so complete that addition of another coat would not increase hiding. Apply coats so as to produce film of uniform thickness.
- P. Install valves and equipment so as to be easy to operate and service. Where geometry of manufactured valves and equipment and field conditions bring about a condition where it is difficult or impossible for an average worker to operate or service an installed valve or piece of equipment, notify Owner's Representative of conflict before installing valve or piece of equipment.
- Q. Repair damage to work that is not cause for rejection.
- R. Repair, correct or replace Work failing tests or inspection. Repeat tests until results satisfy Specifications. Repair damages resulting from tests.

**END OF SECTION**

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**SECTION 01740**  
**CLEANING, FINAL CLEANING, POLLUTION PREVENTION AND DISPOSAL OF WASTE**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Cleaning during construction, pollution prevention during construction, Storm Water Pollution Prevention Plans, final cleaning on completion of Work and disposal of waste.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures

**1.3 Submittals**

- A. Furnish following submittals

SUBMITTAL	DESCRIPTION	
Storm Water Pollution Prevention Plan (SWPPP)	See Paragraph 1.5F below	

**1.4 Cleaning During Construction**

- A. Maintain areas covered by Contract, adjacent properties, and public access roads. Keep these areas free from waste, debris and rubbish caused by construction.
- B. Sweep paved streets daily using self-loading motor sweeper with vacuum and spray nozzles. If streets are kept clean, a lesser frequency may be accepted by Owner's Representative.
- C. Conduct cleaning and disposal to comply with local ordinances and antipollution laws. Do not burn or bury rubbish and waste materials on Site. Do not dispose of volatile wastes, such as mineral spirits, oil or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways. Dispose of asbestos as required by law.
- D. Obtain written permission from property owner prior to disposing of surplus materials, waste products or debris on private property.
- E. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- F. Wet down dry materials and rubbish, apply dust palliative or modify operations as needed to prevent blowing dust.
- G. Provide containers for collection and disposal of waste materials, debris and rubbish.
- H. Clean public access roads to Site. Remove material falling from haul trucks.

**1.5 Pollution Prevention and Storm Water Pollution Prevention Plan**

- A. Contractor shall pay all fines associated with failure to comply with Storm Water Pollution Prevention Plan (SWPPP) requirements of applicable Regional Water Quality Control Board, except where such fines are assessed due to sole negligence of Owner.

- B. Contractor shall retain a certified SWPPP preparer accepted in writing by Owner's Representative to prepare a SWPPP for approval by Owner and applicable local agency and Regional Quality Control Board.
- C. Comply fully with all requirements of SWPPP that govern Contractor's operations and record keeping requirements.
- D. Exercise every reasonable precaution to protect channels, gutters, storm drains, and bodies of water from pollution using best management practices (BMPs) listed in California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook for Construction, latest edition. Water pollution control work shall consist of work necessary to construct those facilities that may be required to protect work area in progress from damage from erosion or impounding of water, prevent erosion and discharge of sediments, and control and abate water pollution. Such work shall include, but not be limited to constructing rock bag berms, desilting basins, drains, fiber rolls and mats, and concrete washout areas.
- E. Prohibit rain runoff or other water from entering pipe trenches and infiltrating to ground water by redirecting surface flows with berms, temporary drains, or other suitable measures. Pump water out of trenches as necessary to control water in excavations.

## **1.6 Disposal of Hazardous Wastes**

- A. Materials which come within category of hazardous waste by virtue of ruling of Federal, State or County Regional Environmental Control Agencies within framework of Federal and State Laws shall be disposed of as prescribed by these rules and laws.
- B. Contractor shall employ a qualified testing laboratory to test for hazardous and toxic components in accordance with California Administrative Code of Environmental Health, Title 22 Division 4.
- C. Test results shall include testing laboratory's determination as to whether or not materials to be disposed of comply with limits set forth in Title 22 for both Soluble Threshold Limit Concentrations (STLC) and Total Threshold Limit Concentration (TTLC) values.
- D. If deemed hazardous, products or materials including items scheduled for demolition as well as paint, spent abrasives, solvents, cleaning compounds and contaminated soils, shall be removed, transported and disposed of in strict accordance with Title 22. Written notification of intent to dispose of waste shall be made to State of California Department of Public Health Services whether sold to a recycling firm or consigned to a hazardous waste hauler.
- E. A receipt for disposition of these materials shall be obtained from consignee, and a certified copy given Owner showing amounts and destination or end use.

## **1.7 Final Cleaning**

- A. Restore construction areas to preconstruction conditions after completing of Work and immediately before final inspection.
- B. Restore lines and grades of areas used for earthwork storage.
- C. Clean, sweep, and wash Work and equipment including finishes.
- D. Remove grease, dust, dirt, stains, labels, fingerprints, and foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated.

- E. Repair, patch, and touch up marred surfaces to specified finish to match adjacent surfaces.
- F. Broom-clean paved surfaces.
- G. Rake-clean other surfaces of grounds.
- H. Remove from Owner's property temporary structures and materials, equipment and appurtenances not required as part of, or appurtenant to, completed Work.
- I. After Work is complete, remove from Site loose concrete, lumber, wire, aggregate or rock piles, reinforcing, rubbish, debris and materials not incorporated in Work. Remove excess pointing mortar materials and other debris within pipes.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION**



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**SECTION 01750  
STARTING AND ADJUSTING**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Testing, adjusting and balancing of systems, manufacturers' approvals of installation, and systems demonstrations.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01400: Quality Requirements
- C. Section 01700: Execution Requirements
- D. Section 01730: Operating and Maintenance Data
- E. Section 01770: Closeout Procedures
- F. Section 01820: Demonstration and Training

**1.3 Submittals**

- A. Furnish following submittals before startup or system demonstration.

SUBMITTAL	DESCRIPTION	
Manufacturer's Written Approval of Installation	Written approval of installation of products shall be certified and submitted by authorized factory representative. This written approval shall state that factory-authorized representative has inspected installation, alignment, lubrication and operation of furnished equipment and found it to fully comply with specified design and warranty requirements and be ready for safe operation.	.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 Preparation**

- A. Pre-startup checkout shall be conducted upon completion of Work.
- B. Clean foreign material from new Work.
- C. To extent possible, turn rotating equipment, operate valves and gates, and check for binding or interference.
- D. Check incoming electric power for voltage amplitude and voltage balance. Check motor driven equipment for correct rotation. Check power draw of equipment.
- E. Verify safety equipment is in place.
- F. Debugging, tune up and adjustments shall be done as needed.
- G. Lubricate mechanical equipment in accordance with Manufacturer's instructions. Lubricating oils and greases shall be of type and viscosity recommended by Manufacturer.

- H. Upon request by Owner, during performance test, furnish services of factory-authorized Manufacturer's representative to inspect and approve, in writing, installation of mechanical equipment furnished by that Manufacturer, to place it into operation, to assist in necessary adjustments and tests and to instruct operating personnel in equipment operation and maintenance.

**END OF SECTION**

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**SECTION 01783  
OPERATING AND MAINTENANCE DATA**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Operation and maintenance manual.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01750: Starting and Adjusting
- C. Section 01787: Product Warranties
- D. Section 01820: Demonstration and Training

**1.3 Submittals**

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Operation and Maintenance Manual	Furnish as described below.	
Equipment Data Sheets	Submit for equipment furnished under each specification section. Include data sheets in Operation and Maintenance Manual. Use attached form and follow format of attached sample Data Sheet to summarize equipment furnished, nameplate data, and equipment Manufacturer's maintenance instructions and recommendations.	

**1.4 Operation and Maintenance Manual**

- A. Prepare and submit 6 copies of Operation and Maintenance Manual containing information itemized and requested in Contract Documents. Deliver 5 copies in D-ring binders tabbed and indexed by specification sections. Include table of contents. Label binders with project name. The sixth electronic copy shall be scanned onto CD Rom disc or flash drive and delivered to Owner in labeled plastic case.
- B. Each section of Operation and Maintenance Manual shall include the following submittals (where required by contract documents) returned and stamped "accepted:"
  - 1. List of equipment furnished for project with name, address, and telephone number of each vendor
  - 2. List of serial numbers of equipment furnished
  - 3. Equipment data sheet describing function of equipment
  - 4. Tabulation of motor nameplate horsepower, nameplate current, field-measured current, overload relay setting, and catalog number for poly-phase motors
  - 4. Catalog data
  - 5. Shop drawings for mechanical, electrical, and instrument equipment in final form
  - 6. Installation or application instructions
  - 7. Operation and maintenance instructions
  - 8. Parts list

9. List of fuses, lamps, seals, and other expendable equipment and devices. Specify size, type, and ordering description. List name, address, e-mail address, fax number, and telephone number of vendor.
- C. Provide manuals for each piece of equipment including individual components and subsystems of complete assemblies. Line out non-applicable text and illustrations. The section of manual on operation shall describe functions and limitations of each component and its relationship to system of which it is a part. Where several models, options, or styles are described, manual shall identify items actually provided.
  - D. Provide the following in each manual:
    - a. Manufacturer's identification, including order number, model, and serial number.
    - b. Paper prints or reviewed shop drawings and diagrams of all systems.
    - c. Certified equipment drawings or reviewed shop drawing data clearly marked for equipment furnished.
    - d. Complete operating and maintenance instructions for each and every item of equipment, setting forth in detail and step-by-step the procedure for starting, stopping, operating, and maintaining entire system as installed. Include schedule of recommended maintenance intervals.
    - e. Complete parts list of replaceable parts, their part numbers, and name and address of their nearest vendor.
    - f. Any special emergency operating instruction and a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of system.
    - g. Copy of Manufacturer's equipment guarantees and warranties.
  - E. Brochures shall be loose leaf with durable plastic or fiberboard covers. Each sheet shall be reinforced to prevent tearing from continued use, and each brochure shall have following information clearly printed on its cover:
    - a. Project name, name of Owner, and address.
    - b. Name and address of Owner's Representative.
    - c. Name and addresses of contractors and subcontractors and department to contact.
    - d. Telephone number of contractors, including night and emergency numbers.
    - e. Major equipment vendors' names and telephone numbers.
  - F. Before requesting payment for 80 percent completion point for total contract, submit two of 6 required copies of Operation and Maintenance Manual containing copies of material available at that time.
  - G. Within 30 days after review and approval by Owner of 2-copy submittal, submit remaining 3 hard copies and one electronic copy of Operation and Maintenance Manual.
  - H. Operation and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions required by Contractor to install, test, and start up equipment.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 – EXECUTION (Not Applicable)**

**END OF SECTION**

## EQUIPMENT MAINTENANCE DATA SHEET

<b>PREVENTATIVE MAINTENANCE PROGRAM</b>		<b>EQUIPMENT RECORD NUMBER</b>		
<b>EQUIPMENT DESCRIPTION</b>		<b>ELECTRICAL OR MECHANICAL DATA</b>		
Name:		Nameplate Horsepower:		
Serial No.:		Model:		
Vendor:		Catalog Number (polyphase motors):		
Vendor Address:		Type:		
		Manufacturer:		
Vendor Rep:		Voltage:	Measured Current:	Nameplate Current:
Phone:		Phase:	Overload Relay Setting:	rpm:
<b>MAINTENANCE AND LUBRICATION WORK TO BE DONE</b>				Frequency*
<b>SPARE PARTS LIST</b>		<b>FUSES/LAMPS/SEALS</b>		
Quantity	Part & Part Number	Qty	Size	Type & Ordering Description
<b>WARRANTY AND OPERATING REQUIREMENTS AND REFERENCE</b>				

\*D - Daily; W - Weekly; B - Biweekly; M - Monthly; Q - Quarterly; S - Semiannually; A - Annually



**SAMPLE  
EQUIPMENT MAINTENANCE DATA SHEET**

<b>PREVENTATIVE MAINTENANCE PROGRAM</b>		<b>EQUIPMENT RECORD NUMBER</b>		
<b>EQUIPMENT DESCRIPTION</b>		<b>ELECTRICAL OR MECHANICAL DATA</b>		
Name: Influent Pump No. 1 Tag No.: P01-1		Nameplate Horsepower: 15 HP		
Serial No.: 123456ABC		Model: 140T Frame Serial No. 987654ZY Class F Insulation w/ Space Heater		
Vendor: ABC Pump Co.		Catalog Number (polyphase motors): M36999b		
Vendor Address: 1234 Richter Avenue Irvine, CA 92604		Type:		
		Manufacturer: DEF Motors, Inc.		
Vendor Rep: XYZ Equipment, Inc.		Voltage: 460	Measured Current: 18 amps	Nameplate Current: 20 amps
Phone: 949-752-0505		Phase: 3	Overload Relay Setting: 25 amps	rpm: 1,800
<b>MAINTENANCE AND LUBRICATION WORK TO BE DONE</b>				Frequency*
1. Operate valves and check such things as a) bearing temperature, b) changes in running sound, c) suction and discharge gage readings, d) pump discharge rate, and e) general condition of drive equipment.				D
2. Check packing.				D
3. Check pumping unit for any dust, dirt or debris.				W
4. Lubricate bearing frame and motor bearings (consult manufacturer's instructions for type of grease or oil).				Q
5. Disassemble and change or repair the following: a) impeller, b) shafts, c) shaft sleeve, d) rotary seals, and e) sleeve bearings.				A
<b>SPARE PARTS LIST</b>		<b>FUSES/LAMPS/SEALS</b>		
Quantity	Part & Part Number	Qty	Size	Type & Ordering Description
<b>WARRANTY AND OPERATING REQUIREMENTS AND REFERENCE</b>				
For manufacturer's instructions regarding installation, operation, maintenance and troubleshooting of this equipment, see Volume _____, Section _____.				

\*D - Daily; W - Weekly; B - Biweekly; M - Monthly; Q - Quarterly; S - Semiannually; A - Annually

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**SECTION 01787  
PRODUCT WARRANTIES**

**PART 1 - GENERAL**

**1.1 Work Included**

- A. Warranties are required for all Work furnished under this contract.
- B. Manufacturer's warranties shall not relieve Contractor of liability required under Contract Documents. Such warranties only shall supplement Contractor's responsibility.

**1.2 Related Work**

- A. Section 01330: Submittal Procedures
- B. Section 01400: Quality Requirements
- C. Section 01750: Starting and Adjusting
- D. Section 01770: Closeout Procedures

**1.3 Submittals**

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Warranty	For equipment bearing manufacturer's warranty in excess of one year, furnish copy of warranty to Owner with Owner named as beneficiary.	

**1.4 One-Year Product Warranties**

- A. Warranties shall cover improper assembly or erection, defective workmanship and products, and incorrect or inadequate operation.
- B. One-year warranty shall be furnished for all Work and manufactured items unless otherwise stated. Warranty shall cover parts, labor, and prompt service for repair of defects, performance failure or damage due to normal wear and tear or due to any cause other than acts of God, or intentional or active and extreme abuse of product. Warranty period shall extend one year beyond final acceptance of completed contract by Owner.
- C. In addition to Manufacturer's standard warranty, furnish services of factory-authorized and factory-trained service technician to promptly provide repair service for mechanical equipment for specified warranty period. This service shall be provided at no cost to Owner and shall include cost of all replacement parts and labor required during that period.

**1.5 Inspection of Installation by Manufacturer**

- A. Should Manufacturer or supplier of any product have reason to suspect said Manufacturer's product has not been installed in accordance with Manufacturer's warranty requirements, Manufacturer shall have right to send their factory authorized representative to inspect facility.
- B. Should Manufacturer's factory-authorized representative elect to inspect installation, said Manufacturer shall promptly notify Owner in writing of any observed deficiencies in installation procedures which might affect required warranty.

- C. Should Manufacturer elect to forego inspection of installation of their products, said Manufacturer shall be precluded from claiming faulty installation by others as relief from honoring furnished warranties.

## **1.6 Eleven-Month Anniversary Warranty Inspection**

- A. Warranty inspection shall be conducted during 11th month following completion of Work.
- B. Locations found in warranty inspection where paving, coating, or paint has peeled, bubbled, or cracked, and locations where rusting is evident will be considered a system failure. Repair defective work identified during warranty inspection by removing deteriorating paving, coating or paint system, cleaning surface, and repaving, recoating, or repainting with same system. Electrically test repaired painted areas. If area of failure exceeds 25% of total paved, coated or painted surface for pavement, coating or paint system on any structure or surface, remove and recoat entire paving, coating or paint system per original specification.
- C. Other failed products found in warranty inspection shall be repaired per warranty requirements.
- D. Owner shall establish date for warranty inspection and shall notify Contractor at least 30 days in advance. If notification of inspection date does not occur within 12 months after final acceptance, first anniversary inspection shall be considered to be waived.

## **1.7 Three-Year Product Warranties and Other Extended Warranties**

- A. Three-year minimum warranty shall be furnished for the following:
  - 1. Air-conditioning and refrigeration systems
  - 2. Water Softener Unit
- B. Three-year warranty shall be 3-year parts-and-labor non-prorated warranty extending from date of Owner's final acceptance. Warranty need not exceed 5 years from date of shipping.
- C. For systems requiring 3-year or extended warranties, every component of system furnished shall be covered under extended warranty, notwithstanding clauses in other sections which may stipulate a lesser warranty for certain components.
- D. Ten-year minimum warranty shall be furnished for the following:
  - 1. Reservoir coatings and liners
  - 2. Roofing
- E. Ten-year warranty shall be 10-year parts-and-labor non-prorated warranty extending from date of Owner's final acceptance. Warranty need not exceed 12 years from date of shipping.
- F. Extended warranty shall cover parts, labor and prompt service for repair of defects, performance failure or damage due to normal wear and tear, or due to any cause other than acts of God, Owner's failure to perform minimum maintenance as set forth in O&M instructions furnished with warranty, or intentional or active and extreme abuse of product. Warranty period shall extend stipulated number of years beyond final acceptance of completed contract by Owner.
- B. Extended warranties shall cover Owner's full cost of restoring non-functional components to their full function as described in Contract Documents and in Manufacturer's published

literature. Prorated warranties will not be accepted. Replacement of damaged parts with old or recycled parts will not be accepted.

- C. Should Manufacturer refuse to provide full extended warranty, Contractor may be required to purchase extended warranty or negotiate with Owner a fair value for a shorter warranty period.

## **1.8 General Warranty Clauses**

- A. Where Specifications stipulate longer warranty period than stipulated in this section, longest and most stringent warranty requirement shall apply.
- B. Warranty period shall begin on earliest of following 2 milestones:
  - 1. Date of formal notification of completion or
  - 2. 30 calendar days after both substantial completion and Owner taking over beneficial use of project.
- C. Warranties shall cover the following:
  - 1. Parts
  - 2. Labor
  - 3. Diagnostics
  - 4. Servicing
  - 5. Removal or Installation Charges
  - 6. Setup and Reconfiguration of System with Replacement Parts
  - 7. Shipping
- D. Where a part is replaced during warranty period, warranty for replaced part and shipping shall be extended to not less than one year following date of replacement. Warranty for labor shall be unchanged.
- E. Following notification of Contractor of a warranty issue, Contractor or their agent shall have 2 weeks to inspect and 30 days to remedy defective work. Failure to perform within this stipulated period will result in damages being assessed against Contractor and responsible parties retroactive to date of discovery.

## **PART 2 - PRODUCTS (Not Applicable)**

## **PART 3 – EXECUTION (Not Applicable)**

**END OF SECTION**

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## SECTION 01820

### DEMONSTRATION, TRAINING AND SPARE PARTS

#### PART 1 - GENERAL

##### 1.1 Work Included

- A. System Demonstration and training of Owner's personnel

##### 1.2 Related Work

- A. Section 01750: Starting and Adjusting
- B. Section 01783: Operating and Maintenance Data

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 – EXECUTION

##### 3.1 System Demonstration

- A. Provide system demonstration for:
  - a. Water Softener
  - b. Chlorination System
  - c. Cabin Assembly and Dis-assembly.
- B. Notify Owner's Representative of time and place of system demonstrations 5 working days before they begin.
- C. Arrange for representatives of equipment suppliers and subcontractors to be present as required to successfully demonstrate installed system.
- D. Perform systems demonstrations in presence of Owner's Representative who will record results. Start up and operate individual subsystems, pieces of equipment, instruments, etc.
- E. Defects and malfunctions disclosed during testing and system demonstration shall be corrected immediately. Work that fails to perform its intended function, and cannot be repaired, shall be replaced with new equipment.

##### 3.2 Field Quality Control

- A. Correct all deficiencies found during system demonstration, including malfunctions of equipment or control systems, leakage, excessive vibration and excessive noise.

##### 3.3 Extra Stock/Spare Parts

- A. Spare parts required shall be delivered in Manufacturer's original containers labeled to completely describe contents and equipment for which it is furnished.
- B. At the completion of system demonstration, refill or recharge all operating fluids, including but not limited to rock salt and chlorine solution.
- C. Upon completion of project, furnish 5 gallons sodium hypochlorite and 50 pounds of salt.

- D. In addition to spare parts listed in Specifications, provide the following spare parts in a lockable toolbox:

ITEM	DESCRIPTION	EQUIPMENT TYPE	QUANTITY
Spare Parts Equipment Storage Container	Storage Box	Storage Box	1 unit
Motor Control Center Light Bulbs	One year supply of fuses and panel lights	Electrical	10% of units
Each Control Panel	Two sets of fuses	Electrical	Two of each fuse required.

### 3.4 **Training of Owner's Personnel**

- A. Conduct training and instruction program on system operation for persons designated by Owner. Furnish services of qualified factory-trained instructors from applicable equipment Manufacturers. Include instruction covering basic operation theory, routine maintenance and repair, and "hands-on" operation of equipment. If not otherwise specified, base duration of program on complexity of equipment involved. Obtain Owner's approval of instruction adequacy before terminating program. Consult Owner to schedule instruction.
- B. As part of training, provide attendees with names, contact persons, telephone numbers and addresses of authorized service centers within 100 mile radius of jobsite for equipment on which training is taking place.
- C. System demonstration testing, final operation testing, and instruction of Owner's personnel may be performed simultaneously, subject to prior approval of extent of consolidation.
- D. The following training is required:

ITEM	LOCATION	CLASSROOM TRAINING DURATION	FIELD TRAINING DURATION	APPROXIMATE NUMBER OF ATTENDEES
Water Softener	On-site	N/A	2 hours	3-10 people
Composting Toilets	On-site	N/A	3 hours	3-10 people
Subsurface Drip Irrigation System	On-site	N/A	2 hours	3-10 people
SDI Pumping System	On-site	N/A	4 hours	3-10 people
Sodium Hypochlorite Feed System	On-site	N/A	2 hours	3-10 people
Electrical System	On-site	N/A	4 hours	3-10 people

**END OF SECTION**



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**SECTION 02050  
DEMOLITION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section includes:

1. Demolition, removal, salvage and disposal of existing material as required to complete Work.
2. Remove propane tank.
3. Remove trees noted on drawings.
4. Clear and grub designated areas.
5. Demolish old well.
6. Remove designated electrical equipment, conduit, wire, etc.

B. Related sections:

1. Additional requirements specified elsewhere:
  - a. Environmental Protection Procedures in General Conditions and Environmental Assessment
  - b. Progress Schedules and Reports: Section 01320
  - c. Submittals Procedures: Section 01330
2. Related Work specified elsewhere:
  - a. Protection of Trees to Remain: Section 02090
  - b. Earthwork: Section 02200
  - c. Cast-In-Place Concrete: Section 03001

**1.2 (Not Used)**

**1.3 (Not Used)**

**1.4 (Not Used)**

**1.5 SUBMITTALS**

- A. Schedule of demolition.

**1.6 QUALITY ASSURANCE**

- A. Submit permits and notices authorizing building demolition.
- B. Submit certificates of severance of utility services.
- C. Submit permit for transport and disposal of debris.

**1.7 (Not Used)**

## **1.8 PROJECT/SITE CONDITIONS**

- A. Erect barriers, fences, guardrails, enclosures, chutes, and shoring as necessary to protect personnel, structures, and utilities remaining intact.
- B. Maintaining access:
  - 1. Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.

## **1.9 SEQUENCING AND SCHEDULING**

- A. Coordinate with OWNER to verify demolition schedule.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify with Owner's Representative that areas to be demolished are unoccupied and discontinued in use.
- B. Do not commence work until conditions are acceptable to Owner's Representative.
- C. Schedule all demolition at least two (2) weeks in advance.

### **3.2 PREPARATION**

- A. Erect barriers, fences, guardrails, enclosures, chutes, and shoring as necessary to protect personnel, structures, and utilities remaining intact.
- B. Remove items scheduled to be salvaged for Owner and place in designated storage area.

### **3.3 APPLICATION**

- A. Demolition:
  - 1. Sprinkle debris and use temporary enclosures as necessary to limit dust to lowest practicable level.
  - 2. Do not use water to extent of causing flooding, contaminated runoff, or icing.
  - 3. Break concrete and masonry into sections less than three (3) feet in any dimension.
  - 4. Repair damage to adjacent structures.
- B. Limits of Disturbance:

Contractor shall restrict his area of operations to avoid damage of trees and shrubs and shall not remove trees unless specifically directed by Contract Documents or at Owner's direction. Contractor shall legally dispose of all material to be removed. If burning is

anticipated, Contractor shall obtain all necessary permits and shall give ample and proper notice to local fire warden.

**3.4 (Not Used)**

**3.5 (Not Used)**

**3.6 CLEANING**

- A. Remove demolition debris daily.
- B. Do not store or burn material on site.
- C. Transport demolition debris to off-site disposal area.
- D. All equipment salvaged for Owner to be cleaned and delivered to Owner's yard as directed by Owner's Representative.
- E. All existing piping that is to be abandoned in place shall be flushed with potable water and left either dry or with potable water. Ends shall be capped or plugged. As-built Drawings must clearly denote extent and elevation of existing facilities abandoned in place.
- F. Any pipe that is shown to be abandoned but is in way of construction may be removed at Contractor's discretion.
- G. Any pipe that is in service must be kept in service until replacement is completed and put in service.

**3.7 (Not Used)**

**3.8 (Not Used)**

**3.9 SCHEDULES**

- A. Salvage schedule:
  - 1. If not listed on following schedule, existing removed materials become property of Contractor and shall be removed from premises.

Salvage Schedule

<u>Item</u>	<u>Disposition</u>
Propane Tank	Coordinate with Propane Provider to purge and remove tank. Pay any costs associated with removal.

**END OF SECTION**

**SECTION 02090  
PROTECTION OF TREES TO REMAIN**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes protection of trees to remain and related work as shown and specified.
- B. The primary area of protection shall be defined as that area within drip line of each tree. Drip line is all area directly under foliage of tree. If that area is quite irregular, then it will be considered to be a circle around tree with a radius equal to distance from center of tree to end of furthest branch.
- C. Except where noted, existing trees are to be protected.
- D. Related sections:
  - 1. Drawings and general provisions of Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 (Not Used)

1.3 (Not Used)

1.4 (Not Used)

1.5 (Not Used)

**1.6 QUALITY ASSURANCE**

- A. Requirements of Regulatory Agencies: All work and materials shall be in full accordance with latest rules and regulations of all legally constituted agencies having jurisdiction. Nothing in Drawings and Specifications is to be construed to permit work not conforming to these rules and regulations.
- B. Supervision: Furnish service of a qualified and experienced superintendent who shall constantly be in charge of Work of this Section and who shall remain at Site at all times that work is in progress.

**1.07 (Not Used)**

## 1.8 PROJECT CONDITIONS

- A. Verification of Trees and Locations: Before proceeding with any work, Contractor shall carefully check and verify all tree quantities and shall immediately inform Owner's Representative of any existing bark damage (which could later be attributed to construction) or discrepancies between Drawings and/or Specifications and actual conditions. No work shall be done in any area where there is any such discrepancy until approval for same has been given by Owner's Representative.
- B. Protection: Contractor shall be responsible for protection in accordance with these Specifications of all existing trees to remain, as shown on Drawings.
  - 1. Vehicular traffic, parking of equipment and storage of materials under drip-line of trees are prohibited at all times.
  - 2. Chemicals, cement, gasoline, oils, and other deleterious substances shall not be stored or used within drip line or within close proximity to trees.

## PART 2 - PRODUCTS

### 2.1 (Not Used)

### 2.2 MATERIALS

- A. All materials used within drip-line of trees to remain shall be as specified; any deviation or substitution from Specifications and/or Drawings must first be approved by Owner's Representative.
- B. Fill Materials: Type specified in 02200, Earthwork.
- C. Temporary Fencing: As required to adequately protect trees.

## PART 3 - EXECUTION

### 3.1 (Not Used)

### 3.2 PREPARATION

- A. Prior to any site work, Contractor shall locate and tag (or identify using temporary penciling) all trees to be removed as shown on Drawings. Contractor shall notify Owner's Representative upon completion of tagging of trees and receive written concurrence of trees before removal of trees. All other trees are to be protected.
- B. Contractor shall protect trees to remain.
  - 1. For trees outside of construction activity, provide temporary fencing at drip line to prevent damage from equipment, personnel, and/or material handling. Fencing may be around individual trees, groups of trees, or larger areas of Site as determined most effective by Contractor as approved by Owner.
  - 2. For trees where construction activity must occur within drip line:

- a. Provide trunk protection, and
  - b. Protect limbs and foliage of tree by limiting height of equipment, limiting areas of access, and/or trimming low hanging limbs as approved by Owner's Representative.
2. Tree protection measures to remain in place for duration of Project.

### **3.3 INSTALLATION**

A. Cuts and fill:

1. Do not grade cuts within drip-line of protected native oak trees

### **3.4 FIELD QUALITY CONTROL**

A. Owner and Contractor agree to the following liquidated damages for each non-compliant act of Contractor:

1. Liquidated damages for vehicles or equipment within drip-line trees to be protected, without written permission of Owner's Representative shall be \$250.00 for each occurrence.
2. Liquidated damages for damages to bark of trees to remain, which was not noted prior to commencing Work shall be \$10.00 per square inch of damaged area.
3. Liquidated damages for removal or breakage of limbs from trees to remain shall be \$15.00 per square inch of limb section at point of cut or break.

B. Contractor shall pay liquidated damages directly to Owner within 2 weeks of being informed by Owner's Representative of each non-compliant act.

C. Contractor shall not be held responsible for damage by vandals or weather.

D. Liquidated damages shall be combined as applicable.

### **3.5 (Not Used)**

### **3.6 (Not Used)**

**END OF SECTION**

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**SECTION 02200  
EARTHWORK**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section includes:

1. Clearing, grubbing, and Site preparation.
2. Removal and disposal of debris.
3. Handling, storage, transportation and disposal of excavated material.
4. Sheeting, shoring, bracing and protection work.
5. Pumping and dewatering as required for all construction.
6. Excavation and trenching.
7. Backfilling.
8. Pipe embedment.
9. Construction of fills and embankments.
10. Surfacing and grading.

B. Related sections:

1. Additional requirements specified elsewhere:
  - a. Submittals Procedures: Section 01330
  - b. Quality Control: Section 00700
2. Related Work specified elsewhere:
  - a. Demolition: Section 02050
  - b. Protection of Trees to Remain: Section 02090
  - c. Paving and Surfacing: Section 02500
  - d. Cast-in-Place Concrete: Section 03001

**1.2 (Not Used)**

**1.3 (Not Used)**

**1.4 (Not Used)**

**1.5 SUBMITTALS**

A. Material samples:

1. Coarse base rock.
2. Drain gravel.
3. Road base.
4. Pipe embedment.
5. Select backfill.
6. General backfill.
7. Riprap.

B. Gradation curves:

1. Coarse base rock.
2. Drain gravel.
3. Road base.
4. Pipe embedment.

**1.6 QUALITY ASSURANCE**

A. Regulatory requirements: Per local codes.

**1.7 (Not Used)**

**1.8 PROJECT/SITE CONDITIONS**

A. Protection:

1. Protect adjacent structures and surrounding areas from damage during excavation, filling, backfilling, and blasting.
2. Do not remove trees except as shown. Protect from damage trees to remain.
3. Protect work from erosion or other similar types of damage until project or segment of project has been completed.
4. Coordinate elements of Work to provide access within construction limits.

B. Weather:

1. Do not backfill or construct fills or embankments during freezing weather
2. Do not use frozen materials, snow, or ice in any backfill, fill area or embankment.
3. Do not backfill or construct fill or embankments on frozen surfaces.
4. Protect all excavations from entry of surface runoff.

C. Naturally occurring asbestos (NOA):

1. Site, as mapped by California Geological Survey in Special Report 190, is not defined as an area likely to contain NOA. However, Contractor is cautioned to be observant for signs of NOA when excavating.
2. Site is subject to requirements of Section 93105 of California Code of Regulations, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying and Surface Mining Operations.

**PART 2 - PRODUCTS**

**2.1 (Not Used)**

**2.2 MATERIALS**

A. Classification of excavated materials:

1. None.
2. Remove and handle excavated materials regardless of its type, character, composition, condition, or depth.

B. Coarse base rock:

1. Granular material, maximum size 3 inches.
2. Less than 10 percent passing 1-inch sieve.
3. Free of dust, clay, or trash.
4. Compact with vibratory plate compactor under direction of Owner's Representative.

C. Drain gravel:

1. Crushed rock.
2. Granular material, maximum size 1-1/2 inches.
3. At least 95 percent retained on No. 4 sieve.
4. Less than 5 percent passing No. 200 sieve.
5. Compact with vibratory plate compactor under direction of Owner's Representative.

D. Sand:

1. Granular material, maximum size #4 sieve.
2. 

<u>Sieve size</u>	<u>% Passing Sieve</u>
#4	90-100
#200	0-5

Road base:

1. Caltrans specification for Class II aggregate base.
2. 

<u>Sieve Size</u>	<u>% Passing Sieve</u>
1"	100
3/4"	90-100
#4	35-55
#30	10-30
#200	2-9
3. Serpentine rock aggregate base will not be allowed.
4. Compact to at least 95 percent of relative compaction based on ASTM D1557-91 test method.
5. The sand equivalent shall not be less than 30.
6. The durability index shall not be less than 35.

E. Pipe embedment:

1. Steel or ductile iron pipe: Road Base compacted to at least 95 percent of relative compaction based on ASTM D1557-91 test method.
2. PVC Pipe: Sand compacted to at least 95 percent of relative compaction based on ASTM D1557-91 test method.

F. Engineered Fill:

1. All pipe backfill, exclusive of pipe embedment, is classified as Engineered Fill.
2. All backfill within 2 feet of structures is classified as Engineered Fill.
3. If sufficient quantities of Engineered Fill cannot be obtained from materials excavated in performance of Work, provide off-site borrow materials for use as Engineered Fill as necessary to complete project.
4. Granular material, maximum size 3 inches, well graded mix with a maximum of 25 percent passing No. 200 sieve. Process as necessary to meet gradation requirements.
5. Free from brush, stumps, logs, roots, debris, and other deleterious material.
6. Compact to at least 95 percent of relative compaction based on ASTM D1557-91 test method.
7. Compact to at least 98 percent of relative compaction based on ASTM D1557-91 test method as shown on the plans and as specified.

G. General Backfill:

1. All backfill not specified or shown as other fill is classified as General Backfill.
2. Native material.
3. Free from brush, stumps, logs, roots, debris, and other deleterious material.
4. Well graded, maximum rock 6-inch. Process as necessary to meet gradation requirements.
5. Compact to at least 90 percent of relative compaction based on ASTM D1557-91 test method.

H. Topsoil:

1. Native material removed and stockpiled before excavation.
2. Free from trash and debris.

I. Riprap:

1. For embankment protection as shown on Drawings.
2. Select from excavated on-site or borrow materials as necessary to complete project.
3. Hard, dense and durable rock.
4. Uniform size with 75 percent larger than 12 inches.
5. Maximum size 18 inches.
6. Minimum size 1-1/2 inches.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

A. Clearing and grubbing:

1. Clear sites to be occupied by permanent construction of logs, trees, roots, brush, tree trimmings, and other objectionable material and debris.

2. Grub stumps.
3. Clean and strip subgrade for fills and embankments of surface vegetation, sod, and organic topsoil.
4. Remove waste materials from Site and dispose daily.
5. Burning on Site is not allowed.
6. Field verify location of all underground utilities, pipelines, and structures.

### **3.2 (Not Used)**

### **3.3 INSTALLATION**

#### **A. General:**

1. Perform Work in a safe and proper manner with appropriate precautions against hazard.
2. Provide adequate working space and clearances for work performed within excavations and for installation and removal of concrete forms.
3. Do not undercut excavation faces for extended footings.
4. Remove soft soil materials, loose materials, wood, debris and deleterious substances encountered within excavated areas.
5. Clean subgrades of loose material before concrete is placed thereon.
6. Preservation of trees.
  - a. Do not remove trees except as noted on the Drawings and specified in Section 02050, Demolition.
  - b. Protect trees left standing from permanent damage by performance of Work, as specified in Section 02090, Protection of Trees to Remain.
7. Except as otherwise authorized, shown, or specified, replace all material excavated below bottom of concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with concrete above.

#### **B. Topsoil:**

1. Remove and stockpile sufficient quality of topsoil to surface to a minimum depth of 4 inches fill, embankment and other areas where original topsoil will be removed or damaged.
  - a. At completion of other work in each area, place and grade topsoil.

#### **C. Dewatering:**

1. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches and other parts of Work. Contractor shall be responsible to control and dewater all water in excavations.
2. Keep each excavation dry during subgrade preparation and continually thereafter until structure to be built or pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
3. Dewater excavations which extend to or below groundwater by lowering and keeping groundwater level beneath such excavation at least 24 inches below bottom of excavation.

4. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property.
5. Contractor is responsible for condition of any pipe or conduit used for drainage. All drainage pipes shall be left clean and free of sediment.
6. Provide and pay for all power, services, manpower, etc., to maintain a completely dry construction site.
7. Obtain all required local, State and Federal permits required to discharge water pumped from excavations.

D. Sheeting, shoring, and bracing:

1. Provide proper and substantial sheeting, shoring and bracing as required to prevent caving or sliding to protect workmen and Work and to protect existing structures and facilities.
2. Design and build sheeting, shoring and bracing to withstand all loads that might be caused by earth movement or pressure and to be rigid, maintaining shape and position under all circumstances.
3. Do not pull trench sheeting before backfilling.

E. Stabilization:

1. Thoroughly compact and consolidate subgrades for roadways, all concrete structures and trench bottoms so they remain firm, dense, and intact during required construction activities.
2. Scarify subgrade to a depth of 6 to 8 inches and prior to subgrade compaction.
3. Remove all mud and muck during excavation.
4. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities.
5. Finished elevation of stabilized subgrades is to be at or below subgrade elevations shown on Drawings.
6. Allow no more than 1/2-inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.

F. General fill requirements:

1. Maximum uncompacted lift of all fill areas: 8 inches.
2. Compact with mechanical tampers approved by Owner's Representative.
3. Compaction by ponding or jetting is not permitted.
4. Use small hand operated compactor within 3 feet of structures.

I. Coarse base rock: Provide as shown on Drawings.

J. Drain gravel:

1. Provide as shown on Drawings under all structures.
2. Provide drain gravel on embankment under riprap.

- K. Road base:
1. Minimum 6 inches thick and thicker where shown on Drawings.
  2. Alternate to use as pipe embedment.
  4. Under slabs on grade.
- L. Pipe embedment:
1. Around all pipes, as shown on the Drawings.
  2. Backfill both sides of pipe installation simultaneously.
- M. Engineered Backfill:
1. Backfill against all walls.
  2. Under all structures.
  3. Under all road construction and slopes.
  4. For all pipe backfill.
- N. Riprap:
1. Provide riprap on embankments and areas shown on Drawings.
- O. General Backfill: All other areas where fill is required to obtain grades shown on Drawings.
- P. Roadway excavation:
1. Excavate unsuitable material from subgrade.
  2. After shaping, roll subgrade compacted to 95 percent of relative compaction based on ASTM D1557-91 test method, to a minimum of 8 inches below subgrade.
- Q. Disposal of excess excavated materials:
1. Use suitable excavated materials in fills and embankments as shown on Drawings to extent needed.
  2. Dispose of excess excavated materials off-site.
  3. Remove unused material from Site and dispose of it.
  4. Remove debris, junk, stones, stumps, logs, roots, and other unsuitable material from Site.
- R. Final grading:
1. After completion of all other outside work and after backfilling and embankments are completed and settled, bring to grade at shown elevations, slopes, and contours all areas of Site to be graded.
  2. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work.
  3. Grade all surfaces for effective drainage.
  4. Provide a 2 percent minimum slope except as otherwise required.
  5. Grade and surface to Owner's Representative's satisfaction.

- S. Settlement:
  - 1. Guarantee against settlement for all fills, embankments, and backfills is one (1) year from final completion of Contract.
  - 2. Repair or replace within 30 days after notice by Owner.

### **3.4 FIELD QUALITY CONTROL**

- A. Owner will arrange and pay for all in-place tests to determine compliance of in-place and backfill materials and compaction with specifications.
- B. Contractor must notify Owner's Representative at least 24 hours in advance of compaction activities.
- C. Fills and embankment:
  - 1. Owner's Representative will arrange for relative compaction test based on ASTM D1557-91 test method, on each type of fill material.
  - 2. Minimum testing of in-place compaction test for each lift of material placed will be one test per location, plus one test for every 50 cubic yards of backfill, as determined by Owner's Representative.
- D. Pipe embedment and backfill:
  - 1. Contractor shall provide initial gradation tests for each type of imported material.
  - 2. Owner's Representative shall provide relative compaction tests, (ASTM D1557-91), for each type of embedment or backfill material proposed. Contractor shall provide sufficient size sample for testing.
  - 3. One (1) in-place density test for each 100 feet of trench, per lift.
  - 4. Other in-place density test selected at random.
- E. Retests of failed compaction shall be performed by Owner, but shall be paid for by Contractor.

**END OF SECTION**



**SECTION 02500  
PAVING AND SURFACING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section includes:

1. Aggregate base, portland concrete paving, and asphaltic concrete paving for access roads, walkways and parking areas.

B. Related sections:

1. Additional requirements specified elsewhere:
  - a. Submittals Procedures: Section 01330
  - b. Quality Control: Section 00700
2. Related Work specified elsewhere:
  - a. Earthwork: Section 02200
  - b. Cast-in-Place Concrete: Section 03001

**1.2 REFERENCES**

A. Reference standards:

1. ASTM C29: Unit Weight and Voids in Aggregate.
2. ASTM C88: Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
3. ASTM C117: Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing.
4. ASTM C126: Sieve or Screen Analysis of Fine and Coarse Aggregates.
5. ASTM C128: Specific Gravity Test and Absorption of Fine Aggregate.
6. ASTM D4: Bitumen Content.
7. ASTM D5: Penetration of Bituminous Material.
8. ASTM D70: Specific Gravity of Semi-Solid Bituminous Materials.
9. ASTM D93: Flash Point by Density-Martens Closed Tester.
10. ASTM D113: Ductility of Bituminous Materials.
11. ASTM D1188: Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin Coated Specimens.
12. ASTM D2041: Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures.
13. ASTM D2172: Quantities Extraction of Bitumen from Bituminous Paving Mixtures.
14. ASTM D2419: Sand Equivalent Value of Soils and Fine Aggregate.
15. ASTM D290: Bituminous Mixing Plant Inspection.
16. ASTM D946: Asphalt Cement for Use in Pavement Construction.
17. ASTM D692: Coarse Aggregate for Bituminous Paving.
18. ASTM D1073: Fine Aggregate for Bituminous Paving Mixtures.
19. ASTM D1016: Cutback Asphalt (Slow Curing Type).
20. ASTM D2027: Cutback Asphalt (Medium Curing Type).
21. ASTM D2028: Cutback Asphalt (Rapid Curing Type).

22. A.I. MS-2: Mix Design Method for Asphalt Concrete.
23. CALTRANS: Standard specifications.

### **1.3 (Not Used)**

### **1.4 SYSTEM DESCRIPTION**

- A. Design requirements:
  1. Density:
    - a. Minimum acceptable density of in-place course materials is 97 percent of recorded laboratory specimen density.
  2. Design mix:
    - a. Determine design mix based upon aggregates furnished:
      - 1) By independent testing laboratory at Contractor's expense.
      - 2) Grade dependent upon temperature.
      - 3) Acceptable to Owner's Representative.
  3. Allowable loading:
    - a. Based on AASHTO standards and H-20 loading.
- B. Performance requirements:
  1. Paving to meet California and local requirements for texture, density, and surface smoothness.

### **1.5 SUBMITTALS**

- A. Product data:
  1. Samples: Provide samples of materials for laboratory testing and job-mix design (Contractor to provide).
- B. Test reports: Submit laboratory reports for following material tests:
  1. Coarse and fine aggregate from each material source and each required grading.
    - a. Sieve analysis: ASTM C136 (AASHTO T19).
    - b. Unit weight of slag: ASTM C29 (AASHTO T19).
    - c. Soundness: ASTM C89 (AASHTO T104).
    - d. Sand equivalent: ASTM D2419 (AASHTO T176).
    - e. Abrasion of coarse aggregate: ASTM 131 (AASHTO T96), for surface coarse aggregates only.
  2. Asphalt cement for each penetration grade.
    - a. Penetration: ASTM D5 (AASHTO T49).
    - b. Viscosity (Kinematic): ASTM D2170 (AASHTO T201).
    - c. Flash point: ASTM D92 (AASHTO T48).
    - d. Ductility: ASTM D113 (AASHTO T51).

- e. Solubility: ASTM D4 (AASHTO T44).
- f. Specific gravity: ASTM D70 (AASHTO T43).
- 3. Job-mix design mixtures for each material or grade.
  - a. Bulk specific gravity for fine aggregate: ASTM C128 (AASHTO T84).
- 4. Uncompacted asphalt concrete mix: maximum specific gravity ASTM D2041 (AASHTO T209).
- 5. Compacted asphalt concrete mix.
  - a. Bulk density: ASTM D1188 (AASHTO T166).
  - b. Marshall stability and flow: ASTM D1559.
- 6. Density and voids analysis.
  - a. Provide each series of asphalt concrete mixture test specimens in accordance with A.I. MS-2 "Mix Design Methods for Asphalt Concrete."
  - b. Use Marshall method of mix design unless otherwise directed or acceptable to Owner's Representative.
- 7. Sampling and testing of asphalt concrete mixtures for quality control during paving operations (provided by Owner).
  - a. Uncompacted asphalt concrete mix.
    - 1) Asphalt cement content: ASTM D2172 (AASHTO T164).
    - 2) Penetration of recovered asphalt cement: ASTM D5 (AASHTO T49).
    - 3) Ductility of recovered asphalt cement: ASTM D113 (AASHTO T51).
  - b. Compacted asphalt concrete mix.
    - 1) Bulk density: ASTM D1188 (AASHTO T166).
    - 2) Marshall stability and flow: ASTM D1559.
  - c. Perform at least one test for each day's paving.
- 8. Asphalt plant inspection: ASTM D290.

## **1.6 QUALITY ASSURANCE**

### **A. Qualifications:**

- 1. The Contractor shall be regularly engaged in construction of aggregate base and asphalt concrete pavement for a period of not less than five (5) years.

## **1.7 (Not Used)**

## **1.8 PROJECT/SITE CONDITIONS**

### **A. Environmental requirements:**

- 1. Do not place asphaltic concrete when air temperature is 50 degrees F or below.
- 2. Do not place asphaltic concrete when subgrade temperature is projected to be 40 degrees F or below in the following 24 hours.

### **B. Traffic control:**

- 1. Maintain vehicular and pedestrian traffic during paving operations.
- 2. Provide barricades, warning signs, and warning lights for movement of traffic and safety and to cause the least interruption of Work.

### **C. Existing condition:**

1. The Contractor is to visit Site and familiarize himself with existing Site conditions.

## **PART 2 - PRODUCTS**

### **2.1 (Not Used)**

### **2.2 MATERIALS**

- A. Aggregate base: Per Section 02200, Road Base.
- B. Tack coat: Emulsified asphalt: SS-1 or SS-1h.
- C. Asphalt cement: ASTM D946, grade determined by design mix.
- D. Aggregate for asphalt concrete, general:
  1. Sound, angular, crushed stone, crushed gravel, or crushed slag: ASTM D692.
  2. Sand, stone or slag screening: ASTM D1073.
  3. Provide aggregate in gradations for various courses to comply with local highway standards, CTSS 39.202 - Class A/B/C.
- E. Base course aggregates:
  1. Uncrushed gravel may be used in mixture if it meets design criteria specified.
  2. Provide uniform quality combined aggregates with a minimum sand equivalent value: 40 for heavy traffic areas.
- F. Surface course aggregates:
  1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
  2. Provide uniform quality combined aggregates with a minimum sand equivalent value: 50 for heavy traffic areas.
- G. Prime coat:
  1. Cut-back liquid asphalt.
  2. Slow-curing type: ASTM D2026, Grade or
  3. Medium-curing type: ASTM D2027, Grade or
  4. Rapid-curing type: ASTM D2028, Grade.
- H. Asphalt concrete per Caltrans specifications.
- I. Portland cement concrete:
  1. Per Specification Section 03001, Cast-In-Place Concrete.

### **2.3 (Not Used)**

### **2.4 EQUIPMENT**

- A. Bituminous pavers: Self-propelled, spreads without tearing surfaces, and controls pavement edges to true lines without use of stationary forms.
- B. Rolling equipment:
  - 1. Pneumatic tired roller.
  - 2. Two (2) or three (3) wheeled steel roller.
- C. Hand tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools.
- D. Portland Cement Concrete:
  - 1. Per Section 03001, Cast-In-Place Concrete.

**2.5 (Not Used)**

**2.6 ACCESSORIES**

- A. Line paint: FS TT-P-115, Class A traffic paint; colors as selected by Owner's Representative.

**2.7 MIXES**

- A. Comply with ASTM D995 for material storage, control and mixing, and for plant equipment and operation.
- B. Stockpiles:
  - 1. Keep each component of various-sized combined aggregates in separate stockpiles.
  - 2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation.
- C. Heating:
  - 1. Heat asphalt cement at mixing plant to viscosity at which it can be uniformly distributed throughout mixture.
  - 2. Use lowest possible temperature to suit temperature-viscosity characteristics of asphalt.
  - 3. Do not exceed 350 degrees F (176.6 degrees C).
- D. Aggregate:
  - 1. Heat-dry aggregates to moisture content of not more than 5 percent.
  - 2. Deliver to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
  - 3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.

- E. Mix aggregate and asphalt cement to achieve 90 to 95 percent coated particles for base mixtures and 85 to 90 percent coated particles for surface mixture, per ASTM D2489.
- F. Transporting:
  - 1. From mixing site in trucks having tight, clean compartments.
  - 2. Coat hauling compartments with lime-water mixture to prevent sticking.
  - 3. Elevate and drain compartment of excess solution before loading mix.
  - 4. Provide covers over asphalt concrete mixture to protect from weather and to prevent loss of heat.
  - 5. During periods of cold weather or for long distance deliveries, provide insulation around entire truck bed surfaces.

## **2.8 FABRICATION (Not Used)**

## **2.9 SOURCE QUALITY CONTROL**

- A. Provide State of California weigh tickets on all asphalt emulsion used on Work.
- B. Provide certificate of compliance for asphalt mix including components, temperature, weights (gross and tare) and time of departure from plant.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- A. Verification of conditions:
  - 1. Record existing elevations in areas where asphalt paving exists.
  - 2. Check subgrade to verify compaction meets requirements.
  - 3. Check subgrade for conformity with elevations and sections immediately before placing aggregate base material.

## **3.2 PREPARATION**

- A. Adjacent structures:
  - 1. The edges of contact surfaces such as curbs, manholes, sidewalks and walls to be painted with tack coat to provide bonded watertight joints.
  - 2. Protect structures to prevent staining on surfaces.
- B. Surface preparation:
  - 1. Place road base material in compacted layers not more than 6 inches thick.
  - 2. Spread, shape, and compact all aggregate base material deposited on subgrade during the same day.
  - 3. Remove loose and foreign material from compacted road base surface immediately before application of paving.

C. Prime coat:

1. Uniformly apply at rate of 0.20 to 0.50 gal/sq yd. over compacted and cleaned road base surface.
2. Apply enough material to penetrate and seal, but not flood surface.
3. Allow to cure and dry as long as required to attain penetration and evaporation of volatiles and in no case less than 24 hours unless otherwise acceptable to Owner's Representative.
4. Blot excess prime coat with just enough sand to prevent pick-up under traffic.
5. Remove loose sand before paving.

D. Tack coat:

1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and surfaces.
2. Apply at rate of 0.05 to 0.15 gal/sq yd. of surface.
3. Apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
4. Allow to dry until tack coat is at correct tackiness to receive pavement.
5. Where asphaltic concrete will adhere to surface, tack coat may be eliminated by Owner's Representative.

E. Not Used

### 3.3 INSTALLATION

A. Placement:

1. Place asphalt concrete mixture on prepared surface, spread, and strike-off using paving machine.
2. Complete pavement over full width of section on each day's run.
3. Minimum temp of 225 degrees F for mixture during placement.
4. Inaccessible and small areas may be placed by hand.
5. Conform to grade, cross-section, finish thickness, and density indicated.
6. Paver placing:
  - a. Unless otherwise directed, begin placing along centerline of areas on crowned section, and at high side on one-way slope, and in direction of traffic flow.
  - b. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
  - c. Complete base courses before placing surface courses.
  - d. Place mixture in as continuous an operation as practicable.
7. Hand placing:
  - a. Spread, tamp, and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to Owner's Representative.
  - b. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.
8. Joints:
  - a. Construct transverse joint at right angles to centerline when operations are suspended long enough for mixture to chill.

- b. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
- c. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
- d. Offset transverse joints in succeeding courses not less than 24 inches.
- e. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
- f. Offset longitudinal joints in succeeding courses not less than 6 inches.
- g. When edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.
- h. Where wearing course constructed in even number of strips; place one (1) longitudinal joint on centerline of road.
- i. Where wearing course constructed in odd number of strips; place centerline of one (1) strip on centerline of road.

**B. Compaction:**

- 1. Provide rollers to obtain required pavement density.
- 2. Begin rolling operations when mixture will bear weight of roller without excess displacement.
- 3. Do not permit heavy equipment, including rollers, to stand on finished surface before it has thoroughly cooled or set.
- 4. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- 5. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- 6. Do not roll centers of sections first under any circumstances.
- 7. Breakdown rolling:
  - a. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
  - b. Operate rollers as close as possible to paver without causing pavement displacement.
  - c. Check crown, grade, and smoothness after breakdown rolling.
  - d. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- 8. Second rolling:
  - a. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
  - b. Continue second rolling until mixture has been thoroughly compacted.
- 9. Finish rolling:
  - a. Perform finish rolling while mixture is still warm enough for removal of roller marks.
  - b. Continue rolling until roller marks are eliminated and course has attained specified density.
- 10. Patching:
  - a. Remove and replace defective areas.
  - b. Cut out and fill with fresh, hot asphalt concrete.
  - c. Compact by rolling to specified surface density and smoothness.
  - d. Remove deficient areas for full depth of course.
  - e. Cut sides perpendicular and parallel to direction of traffic with edges vertical.



- f. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

C. Tolerances:

1. Thickness: Variations from drawings:
  - a. Base course: 1/2-inch±.
  - b. Surface course: 1/2-inch±.
  - c. Total combined thickness:  $1/2\text{-inch} \pm 1/2 + 1/2 = 1$ .
2. Surface smoothness:
  - a. Test using a 10-foot straightedge applied perpendicular to direction of trench.
  - b. 1/4-inch per foot from nearest point of contact.
3. Elevations:
  - a. Match existing elevations at structures.
  - b. Adjust and level existing valve boxes, etc. to match final asphalt grade.

D. Line painting:

1. General: Apply two (2) coats of paint to clean, dry surfaces; do not thin paint.
2. Striping and symbols: As shown at asphalt and Portland Cement concrete pavement, walks, stairs and ramps.
3. Colors:
  - a. Striping and lettering: White.
  - b. Disabled access: Blue; match Color No. 15090 of Federal Standard 595A.
  - c. Fire lane no parking: Red per El Dorado County Fire District requirements with white lettering.

### 3.4 FIELD QUALITY CONTROL

A. Field tests:

1. Test in-place for density, thickness, and surface smoothness.
2. Final surfaces of uniform texture conforming to required grades and cross-sections.
3. Take not less than 4-inch diameter pavement specimens for each completed course from locations as directed by Owner's Representative.
4. Repair holes from test specimens as specified for patching defective work.

B. Inspection:

1. Do not permit pockets or depressions where water may pool.
2. Replaced surface to be even with existing pavement.
3. Test using a 10-foot straightedge applied perpendicular to direction of trench.
4. 1/4-inch per foot from nearest point of contact.

### 3.5 (Not Used)

### 3.6 CLEANING

- A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to satisfaction of Owner's Representative.

**3.7 (Not Used)**

**3.8 PROTECTION**

- A. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case, sooner than six (6) hours.
- B. Provide barricades and warning devices as required to protect pavement and general public.
- C. Cover openings of structure in area of paving until permanent coverings are placed.

**END OF SECTION**

## **SECTION 02510 WATER DISTRIBUTION SYSTEM**

### **Part 1 - GENERAL**

#### **1.01 DESCRIPTION**

This specification applies to installing underground piping, for the water distribution system.

Accessories for the Water System are described in Section 02520 - Water System Accessories.

Water system materials and components inside the water treatment plant building and within 5 feet of the building are described in Section 15052 – Process Piping.

Water system materials and components inside the shower/bathroom building and within 5 feet of the building are described in Section 15140 - Domestic Water Piping and Section 15145 - Domestic Water Piping Specialties.

#### **1.02 SUBMITTALS**

- A. As specified in Section 01300.
- B. Contractor's plan for disposal of chlorinated water.

#### **1.1 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Comply with requirements of California Department of Health, including testing and disinfection.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. NSF Compliance:
  - 1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
  - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

### **Part 2 - PRODUCTS**

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**2.01 PIPE AND FITTINGS**

- A. Pipe sizes are nominal inside diameters unless specifically noted otherwise.
- 2. PVC Pipe
  - a. Schedule 80 Pipe: ASTM D 1785.
  - b. Schedule 80 Socket Fittings: ASTM D 2467.
- 3. Steel Pipe and Joints
  - a. ASTM A53-90b, Schedule 40, galvanized
  - b. Threaded ends: ASME B1.20.1-83, with Teflon thread sealing tape.
- F. Transition joints between new and existing pipes and pipes of different types or class shall be made with standard adapter fittings manufactured specifically for such joints.
- G. Threaded pipe joints shall be made up with Armitite Joint Seal Compound No. 250, Enterprise Commercial Thread Seal, Baker Oil Tool Teflon Bakerseal, or equal.
- H. Unions:
  - 1. All pipe 2 inches and smaller shall use 250-pound screwed galvanized malleable iron unions with ground joints and brass to iron seats.
  - 2. All pipe larger than 2 inches shall use 150-pound flanged connections unions with flat face and approved gaskets.
- I. All fittings shall be compatible with the piping and approved prior to use by the Owner's Representative.

**2.02 TRACER TAPE**

Tracer tape shall be polyethylene film with a metallized foil core, 3 inches wide, and blue color, Reef Industries, Ind's Terra Tape, Calpico, Inc., or equal.

**Part 3 - EXECUTION**

### 3.01 UTILITY TRENCH

See Section 02300, Earthwork for applicable requirements regarding trench excavation and backfill.

### 3.02 PIPE JOINTS AND CONNECTIONS

- A. Use competent tradesmen specially trained in type of work required and using tools and equipment recommended by manufacturers of pipe, fittings, or equipment. Mating joint surfaces shall be wiped clean and dry before assembly.
- B. Make up threaded joints with specified Teflon tape. Provide at least two wraps of tape over threads.
- C. Unions shall be installed, whether shown or not, on threaded piping systems to permit easy disconnection for removal of equipment, tanks, or valves.
- D. Install PVC pipe according to AWWA M23 and ASTM F 645. Bury piping with depth of cover over top as shown. If not shown, install with depth of cover at least 24 inches.
- E. Extend water-service piping and connect to water-supply source and building

### 3.03 PIPE LAYING

- A. After the required bedding has been placed, the pipe, fittings, and valves shall be placed in the trench with care. Under no circumstances shall pipe or other materials be dropped or dumped into the trench. The pipe shall not be dragged in a manner which would cause scratching of the pipe surface. An excessive amount of scratching on the surface of the pipe will be considered cause for rejection.
- B. At the termination of pipe laying, the open end of the pipeline shall be closed off by a suitable cover until laying operations are resumed.
- C. Allow sufficient setup time before disturbing heat-welded joints. Setup time will vary, depending on size, fit, and temperature. Allow cure time before testing in accordance with the manufacturer's instructions.
- D. Service lines and laterals must be assembled so that no strain is placed on the pipe during or after backfill operations. After laying of the pipe is complete, it shall be center loaded with backfill to prevent arching and whipping under pressure. Center loading should be done carefully so that

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joints will be completely exposed for examination during testing, unless conditions warrant complete backfill before testing.

- E. Service connections shall be made with tees, tapped couplings, and other approved fittings.

**3.04 ACCESSORIES**

- A. Thrust blocks, anchors, clamps, and rods on buried Polyethylene waterline shall be located as shown on plans and sized as per manufacturer's recommendations.
- B. Tracer tape shall be laid loosely in trenches containing nonmetallic pipe after the select backfill has been placed covering the pipe. Place tape so it is not broken or stressed by backfilling operations.
- C. Valves, valve boxes, hydrants, water faucets, drinking foundations, air relief valves, and other appurtenances shall be installed in accordance with Section 02650, Water System Accessories.

**3.05 TESTING OF WATERLINES**

- A. The Contractor shall notify the Owner's Representative at least three (3) working days in advance to test on all or any of the piping system.

All waterlines shall be pressure tested in the following manner after installation:

1. Fill the line with clean water.
2. Evacuate all the air.
3. Pump the line up to 150 psi and hold for 4 hours with no pressure drop or leaks, except that normally allowed for valves as specified by the valve manufacturer.
4. The maximum elevation difference of a test section shall be 45 feet. Large systems may be tested in sections.
5. Take all necessary precautions to prevent joints from drawing while pipelines and their appurtenances are being tested. Repairs of damage to the pipes and their appurtenances, or to any other structure, resulting from or caused by these tests, shall be done at no additional cost to the Owner.

**3.06 DISINFECTING WATERLINES**

- A. All new potable waterlines, existing potable waterlines which are connected to a new system, or potable waterlines which are damaged due to the Contractor's operations shall be disinfected as follows:
  - 1. Drain and flush to remove grease and other foreign matter.
  - 2. Fill pipes and fittings with water containing a minimum 100 ppm available chlorine. Open valve and hydrant and run water to waste until strong chlorine test is obtained. Close line and allow chlorine solution to remain in system for a minimum of 24 hours, after which completely drain system and refill with fresh water.
    - a. The above chlorination may be accomplished by using a suitable high-test hypochlorite or similar compounds containing 70 percent available chlorine. Two pounds of hypochlorite per 1,700 gallons of water will provide required 100 ppm.
- B. After chlorination is completed, sample water from the full pipeline and submit sample to proper authorities as directed for bacteriological testing. If the results of testing are unsatisfactory (positive), repeat disinfection, sampling and testing until the two consecutive samples are satisfactory (negative).

### 3.07 OPERATIONAL TEST

- A. After completion of the installation, the system shall be given an operational test to demonstrate the satisfactory overall operation of the installations.
- B. Equipment installed under this project found deficient during the test shall be replaced or revised, as required, to the entire satisfaction of the Owner.

END OF SECTION

## **SECTION 02520 WATER SYSTEM ACCESSORIES**

### **Part 1 - GENERAL**

#### **1.01 DESCRIPTION**

This section applies to the installation of all accessories needed to complete the Water Distribution System so it operates as intended, and in accordance with current health and safety regulations.

Piping materials for the Water System are described in Section 02510 - Water System.

Water system materials and components inside the water treatment plant building and within 5 feet of the building are described in Section 15052 – Process Piping.

Water system materials and components inside the shower/bathroom building and within 5 feet of the building are described in Section 15140 - Domestic Water Piping and Section 15145 - Domestic Water Piping Specialties.

### **Part 2 - PRODUCTS**

#### **2.01 VALVES AND ACCESSORIES**

Unless otherwise shown, all valves shall be the full size of the line in which installed, and be of the type and material specified. Quality of the valves shall be equal to those manufactured by Ford, Crane, Kennedy, Jenkins, R. & G. Sloane, APCO, or Clayton.

##### **A. Gate Valves:**

1. Valves 2 inches and smaller shall have a threaded bronze body with rising stem, screwed bonnet, and solid wedge disc. Valves shall be rated as Class 125 and conform to MSS-SP80. Red-White #208, Stockham #B100, Walworth #55, Nibco #T-111, Crane #428, or equal.
2. Valves larger than 2 inches shall be manufactured in accordance with AWWA standard C-509 and ULC listed. The wedge shall be of cast iron completely encapsulated with rubber. The sealing rubber shall be permanently bonded to the cast iron wedge to meet all ASTM tests for rubber metal bond. The entire gate valve including the gland cover, body and bonnet, shall be epoxy coated



both on the interior and exterior. Each valve shall have maker's name, pressure rating and year in which manufactured, cast on the body. Valve shall be Clow F-6112 or F-6110, or equal.

- B. Air Release Valve: Valves shall have threaded cast iron body, stainless steel float. All internal working parts shall be of stainless steel or bronze. The valve shall work to pressures of 300 psi with a compound lever. Valve shall be APCO # 50, or equal. Install posts as shown. Posts shall be 4-inch x 6-inch x 5-foot, plastic composite, wood simulated, and gray in color.
- C. Furnish and deliver to the State one wrench of each size required to operate underground valves.

## 2.02 CURB STOPS

- A. Install curb stops as shown. Provide single valve box as specified above. Curb stop shall be all bronze and sized to fit the service line. Ford #B66-777-1DR7, or equal.

## 2.03 VALVE BOXES

Single Valve: Locate buried valves in precast concrete valve box as shown with cast iron traffic cover marked "WATER". The box shall be a minimum of 8-1/2 inches inside diameter and a minimum height of 12 inches. Extensions from the bonnet to the valve box shall be with 6 inches minimum I.D. PE, ADS, or ABS pipe.

The quality of the valve boxes shall be equal to Alhambra, Brooks, or Christy.

## 2.04 WHARF HYDRANT ASSEMBLY

Install wharf hydrant and piping as shown. Install post style wharf hydrant with 3 inch NST brass adapter with cap. Post riser shall be 3 inch galvanized steel pipe. Wharf Hydrant Valve shall be 3 inch Greenburg 300, No. 121, or equal.

## 2.05 FAUCETS

- A. Faucets shall be chrome plated, self-closing, and 1/2-inch nominal size. The quality of the valves shall be equal to McMaster-Carr 2945 K2, (catalog 81), Crane, or equal.
- B. Water Service Assembly Posts: Install posts as shown. Posts shall be 4-inch x 6-inch x 5-foot, plastic composite, wood simulated, and gray on color.

- C. ADA Water Service Assembly: ADA water service assembly shall be installed such that it is fully ADA accessible and operational. Water service assembly shall be push-button operated with a hook to hang a typical water bucket, and made for outdoor use. Provide Murdoc model M-84, 513-417-7700, or equal.

### Part 3 - EXECUTION

#### 3.01 ANCHORS AND THRUST BLOCKS

Anchors or thrust blocks shall be formed by pouring concrete between the pipe and trench wall and shall be sized and placed to take all thrusts created by maximum internal water pressure in accordance with the pipe manufacturer's recommendation.

**END OF SECTION**

**SECTION 02535  
SEWER FORCE MAIN AND APPURTENANCES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes pressurized sewer and drainage lines and appurtenances.

**1.2 SUBMITTALS**

- A. Product Data: For the following:
1. Force Main Pipe and Fittings
- B. Field test reports.

**1.3 (Not Used)**

**PART 2 - PRODUCTS**

**2.1 PIPING MATERIALS**

- A. HDPE SDR Pipe:
1. HDPE SDR 11 shall meet ASTM D-2837, and ASTM F-714. HDPE shall have a standard PE code designation of PE 3408 and have a cell classification of 345434C as described in ASTM D-3350.
  2. HDPE pipe shall be Driscoplex 4100 series PE 3408 IPS or approved equal. Performance Pipe (1-800-527-0662).
  3. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
  4. HDPE pipe shall be black in color.
  5. The pipe shall be homogeneous throughout and free of visible cracks, bubbles, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density, and other physical properties and produced to the dimensions and tolerances specified in ASTM F-714. The inside and outside surfaces shall be semi-matte or glossy in appearance. Any pipe not meeting these criteria shall be rejected.
  6. HDPE fittings shall meet ASTM D-3350 and ASTM F-714. All fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor.

7. HDPE pipe and fittings shall be joined with bronze compression fittings. Fittings shall provide a plastic grip ring with directional serrations and internal o-ring seal, Ford Ultratite or approved equal.

## **2.2 PRESSURE SEWER ARV**

### **A. Air Release Valve.**

1. The air vacuum relief valve provides instant and continuous vacuum relief and non-continuous air relief. Both the body and the removable dirt cover shall be constructed of molded plastic. The body and the dirt cover shall be connected with a 3/4 inch hose thread. The ball shall be constructed of low density plastic and the internal seat shall be constructed of vinyl. The air vacuum relief valve shall seal at 5 psi. Inlet size shall be a 1-inch male pipe thread.
2. The air vent shall be Geoflow item number APVBK-1 or approved equal.

### **B. Pipe and fittings: Galvanized steel as shown on the drawings.**

### **C. ARV Box:**

1. Locate buried ARV in precast concrete valve box as shown with cast iron traffic cover marked "SEWER". The box shall be a minimum of 8-1/2 inches inside diameter and a minimum height of 12 inches.
2. The quality of the valve boxes shall be equal to Alhambra, Brooks, or Christy.

## **2.3 Bedding and Backfill Materials:**

- A. Per Section 02200 – Earthwork.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Excavating, trenching, and backfilling are specified in Section 02200 - Earthwork.
- B. Identification: Arrange for installing 3" wide green detectable warning tapes directly over piping and at outside edges of underground structures.
- C. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- D. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Maintain swab or drag in line, and pull past each joint as it is completed.
- E. Install ARV and box as shown.

- F. Set ARV box in earth on concrete masonry unit. Set with tops even with pavement, 1/2 inch above grade in unpaved areas.
- G. Make connections to existing piping and underground structures so finished
- H. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
  - 1. Place plug in end of incomplete piping at end of day and when work stops.
  - 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

### **3.2 FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Defects requiring correction include the following:
    - a. Crushed, broken, cracked, or otherwise damaged piping.
    - b. Infiltration: Water leakage into piping.
    - c. Exfiltration: Water leakage from or around piping.
  - 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 3. Re-inspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate reports for each test.
  - 5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
    - a. Sewer Force Main: Perform hydrostatic test.
      - 1) Allowable leakage is maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period.
      - 2) Close openings in system and fill with water.
      - 3) Purge air and refill with water.
      - 4) Pressurize to 50 psi and maintain for at least 2 hours. Record amount of water to maintain pressure.
      - 5) Test and inspect joints for leaks.
      - 6) Repair defects and re-test until results are satisfactory.

**END OF SECTION**

**SECTION 02734  
SUBSURFACE DRIP IRRIGATION**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

- A. The work of this section consists of furnishing and installing subsurface drip irrigation system for sewage effluent disposal, including piping, emitters, valves, and appurtenances.
- B. Materials, assemblies, and installation of the HDPE Force Main are described in Section 02535 – Sewer Force Main and Appurtenances.

**1.2 DEFINITION**

- A. See Section 02200, Earthwork for applicable requirements regarding trench excavation and backfill.

**1.3 SUBMITTALS**

- A. As specified in Section 01330, Submittal Procedures.
- B. Manufacturer's literature and certificates of compliance with the reference standards for pipe, emitters, valves, filters, fittings, and couplings.
- C. Manufacturer's installation instructions or guide.
- D. Written procedure for cleaning lines and disposing of fluidized materials.

**1.4 PRODUCT HANDLING**

- A. Delivery: Handle components carefully to ensure delivery at the Site in sound, undamaged condition. Owner's Representative will reject damaged materials on site. Contractor shall replace damaged components at no additional expense to the Owner.
- B. Storage: Do not store materials directly on the ground. Adequately support piping to prevent warpage. Use protective covers where pipe may be damaged by direct sunlight.

**PART 2 - PRODUCTS**

**2.1 PVC PIPE**

- A. Schedule 80 Pipe: ASTM D 1785.
- B. Schedule 80 Socket Fittings: ASTM D 2467.

## **2.2 POLYETHYLENE DRIPLINE**

- A. The dripline shall consist of nominal sized one-half inch linear low density polyethylene tubing, with turbulent flow, drip emitters bonded to the inside wall. The drip emitter flow passage shall be 0.032" x 0.045" square.
- B. The tubing shall have an outside diameter (O.D.) of approximately .64-inches and an inside diameter (I.D.) of approximately .55-inches. The tubing shall consist of three layers; the inside layer shall be a bactericide protection, the middle layer shall be black and the outside layer shall be purple striped for easy identification. The dripline shall have emitters regularly spaced 24" apart.
- C. The pressure compensating emitters shall be molded from virgin polyethylene resin with a silicone rubber diaphragm. The pressure compensating emitters shall have nominal discharge rates of 0.53 gallons per hour. The emitters shall be impregnated with Treflan® to inhibit root intrusion for a minimum period of ten years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period.
- D. Wasteflow PC pressure compensating dripline shall be Geoflow model number WFPC16-2-24 or approved equal.

## **2.3 1-1/2 INCH FILTER**

- A. The Y filter body shall be molded from glass reinforced engineering grade black plastic with a 1.5 inch male pipe thread (MIPT) inlet and outlet. The two piece body shall be capable of being serviced by unscrewing and shall include an O-ring seal. An additional 3/4" MIPT outlet shall be included for periodic flushing. The 150-mesh filter screen is all stainless steel, providing a 60.8 square inch filtration area. The outer support shell shall be woven stainless steel wire, and the inner screen shall be made of stainless steel cloth. The inner and outer screens shall be soldered together. The screen collar shall be molded from vinyl.
- B. The 1 ½" filter shall be Geoflow model number AP4E-150-3 or approved equal.

## **2.4 SOLENOID VALVE**

- A. Solenoid Valve: Electrically operated and used to select the dripfield zone, flush the dripfield, and flush the filter. It is normally closed (in the event of a power failure the valve closes). The solenoid valve shall have a cold water working pressure of 150 psi.
- B. Diaphragm: Dual ported to minimize clogging and prevent diaphragm "stretching", nylon fabric reinforced Buna-N rubber; grooved rib interlock with cover and body to prevent leakage. Diaphragm shall include a shock cone to eliminate water hammer.
- C. Exhaust orifice: Non-corrosive nylon with an opening sized larger than the diaphragm ports so that any pieces of sand or silt passing through the diaphragm will not be trapped beneath the solenoid actuator.
- D. Solenoid: Constructed of molded epoxy resin having no carbon steel components exposed thereby eliminating possible external corrosion and deterioration. Solenoid



shall be completely waterproof, with an O-ring seal, and comply with NEC Class II circuit requirements for 24V a.c. operation.

- E. Actuator: Teflon coated stainless steel and brass with a molded-in place rubber exhaust port seal and a stainless steel spring to assure positive seating.
- F. Valve Body: High strength plastic, glass-filled body and cover shall be designed to operate in heavy duty commercial applications. Cover bolts shall be ¼ inch stainless steel with mating brass body inserts to make re-assembly easy.
- G. Throttling Valve: Flow control shall be accomplished with a brass, non-rising type flow control stem for throttling the valve from full open to close positions.
- H. Manual bleed lever: An easy-to-use, hand operated control bleeds valve to downstream; has stops for open and closed positions.

## **2.5 AIR VACUUM RELIEF**

- A. The air vacuum relief valve provides instant and continuous vacuum relief and non-continuous air relief. Both the body and the removable dirt cover shall be constructed of molded plastic. The body and the dirt cover shall be connected with a 3/4 inch hose thread. The ball shall be constructed of low density plastic and the internal seat shall be constructed of vinyl. The air vacuum relief valve shall seal at 5 psi. Inlet size shall be a 1-inch male pipe thread.
- B. The air vent shall be Geoflow item number APVBK-1 or approved equal.

## **2.6 PVC BALL VALVE**

- A. True unions, full port, 150 psi rated, Viton O-rings, Teflon seats, Chemtrol, TU or equal.

## **2.7 PVC CHECK VALVE**

- A. True union, 150 psi rated, Viton O-rings, Chemtrol or equal.

## **2.8 VAULTS**

- A. ARV and Check Valve vaults shall be polyester/fiberglass, ultraviolet inhibitors, suitable for outdoor service, minimum 9 inches inside diameter, with lid of same material, lid stamped "SEWER", Fibrelyte FL8 Box 9" X 12", manufactured by Christy Concrete Products, Fremont, CA (800) 486-7070 or approved equal.

# **PART 3 - EXECUTION**

## **3.1 GENERAL**

- A. Construct the subsurface drip irrigation system, complete with appurtenances, to the lines and grades shown or established in the field.

### **3.2 TRENCHING**

- A. Section 02200, Earthwork.

### **3.3 BEDDING**

- A. Section 02200, Earthwork.

### **3.4 2-INCH FORCE MAINS**

- A. Section 02535.

### **3.5 1-1/2 INCH MANIFOLD, SUBMAIN MANIFOLD AND FLUSH LINE PIPE INSTALLATION**

- A. Inspection: Inspect pipe for defects before lowering into trench. Defective, damaged, or unsound pipe will be rejected.
- B. Laying: After the trench bottom has been properly prepared for pipe installation as specified in Section 02200, Earthwork, lay pipe true to line and grade, to form smooth joint transitions and to prevent sudden offsets of the flow line.
- C. Cleaning: As work progresses, clear the pipe interior of dirt and other debris by keeping swabs in the pipe and pulling them forward past each completed joint.
- D. Pipe Cutting: Cutting for closure or other reasons shall be done neatly by methods recommended by the manufacturer. Sharp edges shall be smoothed to prevent gasket damage.
- E. Deflection of Pipe at Joints: Follow deflection guidelines of the pipe manufacturer.
- F. Backfilling: Section 02200, Earthwork.
- G. Final Pipe Cleaning: Prior to testing, clean all lines to be tested by high-pressure water jet or mechanical means. Remove and dispose of fluidized materials as approved.
- H. Utility Line Marking: Section 02535.

### **3.6 DRIPLINE INSTALLATION**

- A. Confirm that all materials required for installation are on Site before opening trenches. Pre-assemble as many sets of components as practical above ground. Glue compression or lockslip adapters to PVC tees. Pre-assemble riser units and sub-main manifold and use to mark the beginning and end of driplines.
- B. Condition soil moisture the day before opening trenches or installing driplines. The soil should be moist but still should allow the proper operation of the installation equipment. The soil surface should be dry so that the installation equipment maintains traction.
- C. Mark the four corners of each zone. The top two corners should be at the same elevation and the bottom two corners should be at a lower elevation.

- D. Install the manifold from the force main connection, up hill through one lower and one upper corner stake of the disposal field.
- E. Paint a line between the two remaining corner stakes. The painted line should be at a constant elevation.
- F. Install the dripline from the supply line trench to the painted line, approximately 8" to 12" deep. Upon reaching the painted line, cut the dripline 1' above the ground. Continue this process until the required footage of pipe is installed. Dripline must be spaced 2 ft. apart. Depth of burial of dripline must be consistent throughout the field. Take care not to get dirt into the lines.
- G. Install the supply manifold with tees lined up at each dripline.
- H. Hook up the driplines to the manifold. Do not glue dripline.
- I. Fill the effluent pump station with fresh water and turn on the pump. Check for flow out the ends of all of the driplines. Let the pump run for about 5 minutes to flush out any dirt. Shut off the pump and tape the ends of the lines.
- J. Install the return manifold and check valves and connect all of the driplines. Insure that the driplines are not kinked.
- K. Install an air vacuum breaker at the highest point in each zone of the disposal field. Use Teflon tape and hand tighten.
- L. Turn on the pump and check the pressure at the air vacuum breakers. If pressure is not between 15 psi and 45 psi, repair and/or adjust system until this pressure range is obtained.

### **3.7 SURFACE FINISH WORK**

- A. Section 02200, Earthwork.

**END OF SECTION**

**SECTION 02821  
CHAIN-LINK FENCES AND GATES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Galvanized steel chain-link fabric.
  - 2. Galvanized steel framework.
  - 3. Galvanized steel chain-link gates.

**1.2 SUBMITTALS**

- A. Product Data: For each product shown.

**PART 2 - PRODUCTS**

**2.1 CHAIN-LINK FENCE FABRIC**

- A. Steel Chain-Link Fence Fabric: Comply with Chain Link Fence Manufacturers Institute's "Product Manual."
  - 1. Mesh and Wire Size: 2-inch mesh, 0.120-inch diameter
  - 2. Zinc-Coated Fabric: ASTM A 392, with zinc coating applied to steel wire mesh fabric after weaving with Class 1, 1.2-oz./sq. ft. minimum coating weight.
- B. Fabric Selvage: Twisted at top selvage and knuckled at bottom.

**2.2 INDUSTRIAL FENCE FRAMING**

- A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1043. ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. zinc; and line, end, corner, and pull posts and top rail as required for Heavy Industrial Fence.
- B. Round Steel Pipe: Cold-formed, electric-resistance-welded steel pipe. ASTM F 1043, Material Design Group IC, with external and internal coatings; and line, end, corner, and pull posts and top rail as required for Heavy Industrial Fence.
- C. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.
- D. Top Rails: With swedged-end or fabricated for expansion-type coupling.
- E. Intermediate Rails: Match top rail for coating and strength and stiffness requirements.

- F. Bottom Rails: Match top rail for coating and strength and stiffness requirements.

## **2.3 GATES**

- A. Swing Gates: Comply with ASTM F 900 for gates, made from pipe and tubing complying with ASTM F 1043, complete with hardware.
  - 1. Frames and Bracing: For gate fabric height as shown.
    - a. Corners: Welded.
  - 2. Gate Posts: Fabricate members from round galvanized steel pipe for gate fabric heights by leaf widths shown.

## **2.4 TENSION WIRE AND FITTINGS**

- A. Metallic-Coated Steel Tension Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 824 at locations indicated.
- B. Fittings: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.

## **2.5 CAST-IN-PLACE CONCRETE**

- A. General: Per Section 3301, Cast in Place Concrete.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated. Do not begin installation before final grading is completed, unless otherwise permitted by Owner's Representative.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings shown, in firm, undisturbed or compacted soil.
- C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil.
  - 1. Concrete Footings: Place concrete around posts and vibrate or tamp for consolidation. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured. Set the following post types in concrete footings and protect portion of posts aboveground from concrete splatter:
    - a. Terminal.
    - b. Line; Using mechanical devices to set line posts per ASTM F 567 is permitted.
    - c. Gate.

- D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.
- E. Line Posts: Space line posts uniformly at 10 feet o.c.
- F. Intermediate Rails: Install in one piece as shown, spanning between posts, using fittings, special offset fittings, and accessories.
- G. Bottom Rails: Install as shown, spanning between posts, using fittings and accessories.
- H. Chain-Link Fabric: Apply fabric to outside of enclosing framework.
- I. Tie Wires: Attach wire to chain-link fabric per ASTM F 626. Tie fabric to line posts at maximum interval of 12 inches o.c. and to braces at maximum interval of 24 inches o.c.
- J. Gate Installation: Install gates level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust gate to operate smoothly, easily, and quietly throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

**END OF SECTION**

**SECTION 02835  
WELDED STEEL GATE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This section includes the fabrication, installation, and painting of a welded steel vehicle gate.
- B. Related sections:
  - 1. Additional requirements specified elsewhere:
    - a. Quality Control: Section 00700
    - b. Submittals and Procedures: Section 01330
  - 2. Related work specified elsewhere:
    - a. Painting: Section 09901

**1.2 (Not Used)**

**1.3 (Not Used)**

**1.4 (Not Used)**

**1.5 SUBMITTALS**

- A. Submit shop drawings showing all materials, connections, supports and dimensions.

**1.6 QUALITY ASSURANCE**

- A. Welding shall be performed in accordance with AWS "Code for Welding in Building Construction."
- B. Certification: Welding shall be performed by a welder certified as required for intended work.

**PART 2 - PRODUCTS**

**2.1 (Not Used)**

**2.2 MATERIALS**

- A. Steel Pipe: Standard Weight, ASTM A53, Type E or S. Grade B, or Standard Weight, ASTM A36, steel pipe.
- B. Miscellaneous Steel: ASTM A36.
- C. Metal Primer Paint: See Section 09901.
- D. Metal Finish Paint: See Section 09901.

## **PART 3 - EXECUTION**

### **3.1 (Not Used)**

### **3.2 PREPARATION**

#### **A. Gate:**

1. Fabricate gate, posts, hinges, and locking device as shown on the plans.
2. Continuously weld all joints and grind exposed welds smooth.
3. Set gate posts in concrete as shown on the plans straight and plumb.
4. Hang gate and secure with field welds.
5. Gate shall swing freely in level plane. Grease as required.

#### **B. Paint:**

1. Remove all weld spatter and clean steel surfaces of dirt, grease, and oil.
2. Treat surfaces to be painted with phosphoric acid and vinyl resin primer pre-treatment, Formula No. 117, for metals, or equal.

### **3.3 (Not Used)**

### **3.4 (Not Used)**

### **3.5 (Not Used)**

### **3.6 (Not Used)**

### **3.7 (Not Used)**

### **3.8 (Not Used)**

### **3.9 SCHEDULES**

- A. Apply one coat metal primer paint on all exposed surfaces.
- B. Apply two each coats of metal finish paint over primer paint.
- C. Owner's Representative to approve color of finish paint.

**END OF SECTION**



## SECTION 02870 SITE FURNISHINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Outdoor Tables
  - 2. Barbeques.
  - 3. Food Storage Containers.
  - 4. Projection Screen Material.
  - 5. Bulletin Boards.
  - 6. Trash receptacles.

#### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Material Certificates: For the following:
  - 1. Wood preservative treatment.
  - 2. Sustainably harvested wood.
  - 3. Recycled plastic.
- C. Maintenance data.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

#### 2.2 MATERIALS

- A. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat and manufacturer's standard finish.
- B. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
  - 1. Polyethylene: Fabricated from virgin plastic HDPE resin.
  - 2. Recycled Polyethylene: Fabricated from not less than **96 percent recycled, purified, fractional-melt plastic resin** for not less than **90 percent recycled postconsumer waste by weight** content HDPE.

- C. Anchors, Fasteners, Fittings, and Hardware: Commercial quality; vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site and street furnishings' assembly, mounting, and secure attachment.
  - 1. Material: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials.
  - 2. Angle Anchors: For inconspicuously bolting legs of site and street furnishings to on-grade substrate.
  - 3. Antitheft Hold-Down Brackets: For securing site and street furnishings to substrate.
- D. Erosion-Resistant Anchoring Cement: Factory-packaged formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended for exterior applications.
- E. Galvanizing:
  - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of **0.9 oz./sq. ft.** of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent, not less than **0.3-mil-** thick, zinc pigmented coating.
  - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

## 2.3 OUTDOOR TABLE

- A. Cooking/Serving Tables.
  - 1. Rectangular Pedestal Table, approximately dimensions 32"x72".
  - 2. Top, anodized aluminum.
  - 3. Legs, 4" square steel post, powder coated.
  - 4. "The Park" item 398-1452 or approved equal.
- B. Picnic Tables.
  - 1. Accessible picnic tables, 96"x 29" tabletop; 33" height
  - 2. Top, recycled plastic.
  - 3. Seats, recycled plastic, 72"x9-1/2"; 20"height.
  - 4. Frame, recycled plastic with stainless steel hardware.
  - 5. "PicnicTables.com" model 1ZK5612 or approved equal.
  - 6. Provide accessible tables, number and location as shown on Drawings.

## 2.4 BARBEQUES

- A. Post-mounted universal access designed to burn either charcoal or wood
  - 1. Firebox, 3/16" steel; approximately 18"x24" dimensions.
  - 2. Grill, 1/2" round bars at 1" on center; configured to allow adjustment to at least 4 heights over fire.
  - 3. Pedestal, 3-1/2" steel pipe; configured for vandal-resistant installation.
  - 4. Belson Model FC-1193-BHC or approved equal.

## 2.5 FOOD STORAGE LOCKERS

- A. Steel construction; 30 cubic foot capacity; 37"wx48"; assembled height approximately 47"; extended legs to meet ADA guidelines; hinged doors on long side to facilitate easy access; animal-proof pocket latches; inside child safety latch; tan powder coat finish; zinc plated hardware.

## 2.6 PROJECTION SCREEN MATERIAL.

- A. Screen Material: Theater grade PVC material; 1.1 gain matte white projection surface; textured surface to eliminate hot-spotting; wide diffusion uniformity; black matt borders; 114" diagonal size with 16:9 viewing angle: grommets along edge for fastening with rope.
- B. Screen supports 6"x6" Treated timbers.
- C. Elite Screens DIY Series, DIY114H or approved equal.

## 2.7 BULLETIN BOARDS.

## 2.8 TRASH RECEPTACLES

- A. Aluminum Facing Surrounds: **Aluminum sheet.**
- B. Steel Facing Surrounds: **Steel sheet.**
- C. Wood Facing Surrounds: **Evenly spaced, Douglas fir slats.**
- D. Fiberglass Facing Surrounds: Molded fiberglass shape.
- E. Plastic Facing Surrounds: **Molded HDPE shape.**
- F. Support Frames: **Galvanized steel**; welded.
- G. Style: **As indicated by manufacturer's designation.**
- H. Inner Container: **Aluminum** container **with drain holes and lift-out handles** designed to be removable and reusable.
- I. Disposable Liners: Provide receptacle designed to accommodate disposable liners.
- J. Capacity: Not less **55 gal**
- K. Service Access: [**Fixed lid or top, side access**, inner container and/or disposable liner lifts or slides out for emptying; **self-latching hinge.**
- L. Installation Method: **Freestanding with weighted base.**
- M. Aluminum Finish: Color coated.
  - 1. Color: **As indicated by manufacturer's designation**
- N. Steel Finish: **Galvanized and color coated.**

1. Color: **As indicated by manufacturer's designation**

O. Wood Finish: **Unfinished.**

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Complete field assembly of site and street furnishings, where required.
- B. Unless otherwise indicated, install site and street furnishings after landscaping and paving have been completed.
- C. Install site and street furnishings level, plumb, true, and **positioned** at locations indicated on Drawings.
- D. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site and street furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with **nonshrink, nonmetallic grout or anchoring cement**, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with **nonshrink, nonmetallic grout or anchoring cement**, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

**END OF SECTION**

**SECTION 02905  
EROSION CONTROL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This work shall consist of installing erosion control measures on areas indicated on Drawings and required by SWPPP.
- B. The Contractor shall furnish all labor and materials to install erosion control measures.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Straw shall be derived from wheat, oats, or barley. Contractor shall furnish evidence that clearance has been obtained from County Agricultural Commissioner, as required by law, before straw obtained from outside of the county in which it is to be used is delivered to site of work. Straw that has been used for stable bedding shall not be used.
- B. Hi-velocity erosion control blankets shall be Curlex, manufactured by American Excelsior Company or equal. Staples shall be steel U-shape 10 inch x 2 inch x 10 inch, 11 gauge. In hard ground, 8-inch staples may be used with prior approval of Owner's Representative.

**PART 3 - EXECUTION**

**3.1 PREPARATION OF SLOPES AND PLANTING AREAS**

- A. Construct waterbars to direct water into established growth areas. Waterbars shall be constructed at 50 feet on center. Additional waterbars shall be constructed at locations shown on Drawings.
- B. Preparation of slopes for erosion control blanket shall include loosening soil surface with hand tools to hold seed and fertilizer.

**3.2 STRAW APPLICATION**

- A. Spread straw uniformly over area at a rate of 4000 pounds per acre. Straw shall be spread immediately after application of seed and fertilizer.
- B. Incorporate straw with a sheeps-foot compactor or a roller specifically constructed to incorporate straw.

### **3.4 INSTALLATION OF EROSION CONTROL BLANKET**

- A. Install erosion control blankets on slopes per Manufacturer's recommendations.
- B. Install immediately after application of seed and fertilizer.
- C. Install erosion control blankets in all waterbar drainage swales and over berms.
- D. Leave in place at completion of Work.

### **3.5 CLEANUP**

- A. Remove all fertilizer and seed bags, ties, etc., from Site.

**END OF SECTION**

**SECTION 03001  
CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes:
1. Cast-in-place concrete.
  2. Reinforcing steel.
  3. Forms.
  4. Concrete accessories.
- B. Related sections:
1. Additional requirements specified elsewhere:
    - a. Submittals Procedures: Section 01330
    - b. Quality Control: Section 00700
  2. Related Work specified elsewhere:
    - a. Demolition: Section 02050
    - b. Earthwork: Section 02200
    - c. Paving and Surfacing: Section 02500
    - c. Welded Steel Gates: Section 02835
    - d. Grout: Section 03600

**1.2 REFERENCES**

- A. Reference standards:
1. Latest version of all.
  2. ACI 214: Recommended Practice for Evaluating Compression Test Results of Field Concrete.
  3. ACI 224: Control of cracking in Concrete Structures.
  4. ACI 224.3: Joints in Concrete Construction.
  5. ACI 301: Specifications for Structural Concrete.
  6. ACI 305: Recommended Practice for Hot Weather Concreting.
  7. ACI 306: Recommended Practice for Cold Weather Concreting.
  8. ACI 306.1: Standard Specifications for Cold Weather Concreting.
  9. ACI 315: Manuals of Standard Practice for Detailing Reinforced Concrete Structures.
  10. ACI 318: Building Code Requirements for Reinforced Concrete.
  11. ACI 347: Recommended Practice for Concrete Formwork.
  12. ACI 350: Environmental Curing Concrete Structures.
  13. ASTM A82: Cold-Drawn Steel Wire for Concrete Reinforcement.
  14. ASTM A185: Welded Wire Fabric for Concrete Reinforcement.
  15. ASTM A497: Welded Preformed Steel Wire Fabric for Concrete Reinforcement.
  16. ASTM A615: Deformed Billet-Steel Bars for Concrete Reinforcing.
  17. ASTM C31: Making and Curing Concrete Test Specimens in the Field.

18. ASTM C33: Concrete Aggregate.
19. ASTM C39: Test for Compressive Strength for Cylindrical Concrete Specimens.
20. ASTM C94: Ready-Mixed Concrete.
21. ASTM C127: Test for Specific Gravity and Adsorption of Coarse Aggregate.
22. ASTM C128: Test for Specific Gravity and Adsorption of Fine Aggregate.
23. ASTM C136: Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.
24. ASTM C143: Test for Slump of Portland Cement Concrete.
25. ASTM C150: Portland Cement.
26. ASTM C192: Making and Curing Concrete Test Specimens in the Laboratory.
27. ASTM C231: Test for Air Content of Freshly Mixed Concrete.
28. ASTM C260: Air Entraining Admixtures for Concrete.
29. ASTM C494: Chemical Admixtures for Concrete.
30. ASTM C618: Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement.
31. PS1: Construction and Industrial Grade Plywood (ANSI A199.1).

**1.3 (Not Used)**

**1.4 (Not Used)**

**1.5 SUBMITTALS**

A. Product Data and Shop Drawings:

1. Reinforcing bar lists and fabrication placement and Drawings.
2. Product information for all additives, sealers, form ties, form coating, waterstops, and accessories.
3. Concrete mix design and concrete color.

**1.6 QUALITY ASSURANCE**

- A. Tolerances: ACI 301 and ACI 347 as modified herein. In case of conflict ACI 347 governs over ACI 301.
- B. Compliance with the requirements specified herein may necessitate modification to the manufacturer's standard material or equipment.
- C. Concrete mix design:
1. Contractor to provide and pay for the concrete mix design.
  2. Test the proposed concrete mix for each size and gradation of aggregates and each consistency intended for use in the project.
  3. Aggregates:
    - a. Sample and test according to ASTM C33.
    - b. Determine bulk specific gravity in accordance with ASTM C127 and C128.
  4. Compression tests:



- a. Prepare one (1) set of compression test cylinders from each proposed concrete mix, four (4) cylinders per set.
- b. Test one (1) set of four (4) cylinders at seven (7) days, two (2) at 28 days. Hold one.
- c. Make, cure, and store in accordance with ASTM C192.
- d. Test in accordance with ASTM C39.
- 5. Slump test: ASTM C143.
- 6. Total air content: ASTM C231.
- 7. Initial set test:
  - a. In accordance with ASTM C403.
  - b. Test at 70 degrees F and 90 degrees F ambient.
  - c. Test at 70 degrees F on mix including specified plasticizing and air entraining admixtures.
  - d. Test at 90 degrees F on mix including specified retarding and air entraining admixtures.
- 8. Fly ash: Supplier's chemical composition and physical analysis test.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

### **A. Storage and protection:**

- 1. Cement and fly ash.
  - a. Store in moistureproof enclosures.
  - b. Do not use if caked or lumpy.
- 2. Aggregate.
  - a. Store to prevent segregation and inclusion of foreign materials.
  - b. Do not use the bottom 6 inches of piles in contact with the ground.
- 3. Reinforcing steel: Store on supports that will keep it from contact with the ground.
- 4. Rubber and plastic materials.
  - a. Store in a cool place.
  - b. Do not expose to direct sunlight.
- 5. Sealers, form coatings, etc.
  - a. Store indoors according to manufacturer's request.
  - b. Discard any improperly stored materials.

### **B. Acceptance at site:**

- 1. Prepare a delivery ticket for each load of ready-mixed concrete.
- 2. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
- 3. Ticket to show actual:
  - a. Quantity delivered.
  - b. Actual amount of each material in batch.
  - c. Outdoor temperature in the shade.
  - d. Time at which cement was added.
  - e. Truck, project, and mix design identification number.
- 4. Failure to provide the delivery ticket will be cause to reject the load.

## **1.8 (Not Used)**

### **PART 2 - PRODUCTS**

## **2.1 (Not Used)**

## **2.2 MATERIALS**

### **A. Forms:**

1. Prefabricated: Simplex "Industrial Steel Frame Forms," Symons "Steel Ply," Universal "Uniform," or equal.
2. Plywood: PS1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete, Grade B or better.
3. Fiberboard FS LLL-B-810, Type IX, tempered, waterproof, screen back, concrete form hardboard.
4. Lumber: Straight; uniform width and thickness; and free from knots, offsets, holes, dents, and other surface defects.
5. Form coating: Industrial lubricants "Nox-crete Form Coating," W. R. Meadows "Durogard," PRECO "Reebol Form Cote," or equal.
6. Form ties: Removable end, permanently embedded body type not requiring auxiliary spreaders, with cones on outer ends, embedded portion 1-inch minimum back from concrete face. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.

### **B. Reinforcing steel:**

1. Bars: ASTM A615, Grade 60.
2. Beam stirrups and column ties: ASTM A615, Grade 40.
3. Welded wire fabric: ASTM A185 or A497.
4. Bar supports: PS7; CRSI Class B or E, fabricated from galvanized wire or having stainless steel legs.

### **C. Concrete:**

1. Cement: ASTM C150, Type II or Type II LA.
2. Fly ash: ASTM C618, Class F, except loss on ignition not more than 5 percent.
3. Fine aggregate: clean, natural sand, ASTM C33, or natural materials processed to conform to ASTM C33.
4. Coarse aggregate: crushed rock, natural gravel, or other inert granular material, ASTM C33 except clay and shale particles no more than 1 percent.
5. Water: clean and free of deleterious substances.
6. Admixtures:
  - a. Retarder: ASTM C494, Type D; Grace "Duratard-HC," Master Builders "Pozzolith 300-R," Protex "Protard," Sika Chemical "Plastiment".
  - b. Plasticizer: ASTM C494, Type A; Grace "Daracem-100," Master Builders "Rheobuild 1000".
  - c. Air entraining agent: ASTM C260; Grace "Darex AEA," Master Builders "Micro-Air," W. R. Meadows "Sealtight".

- d. Water reducer: Master Builders "Pozzolith 322N.
- e. Or equal."

D. Accessories:

- 1. Membrane curing compound: FS TT-C-600, Type 1; Protex, triple seal; chlorinated rubber, min 18 percent solids; Grace "Dekote", Process Solvent "Concrete Treatment ALX-9", TK Products :Tri-Kote TK-18", or equal.
- 2. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inch long.

**2.3 (Not Used)**

**2.4 (Not Used)**

**2.5 (Not Used)**

**2.6 (Not Used)**

**2.7 MIXES**

- A. Design concrete mix within limits specified.
- B. Comply with ASTM C94.
- C. Cement content:

- 1. Minimum Portland Cement, lbs/cu yd, for concrete containing a water reducing admixture:

Concrete Slump	Coarse Aggregate Size from No. 4 Sieve to		
	1/2"	3/4"	1"
2"	573	545	517
3"	592	564	536
4"	611	583	555

- 2. If water reducing admixture is omitted, increase cement content 10 percent.
- 3. Contractor may substitute fly ash for up to 15 percent of cement at a rate of 1.5 lbs fly ash for each 1 lb of cement.

D. Water cement ratio:

- 1. The water cement ratio shall not exceed 0.45. If fly ash is used the cement-plus-fly ash ratio (W/C+F) shall not exceed 0.40.

E. Slump:

1. Maximum 4-inch slump.

F. Volume ratio of fine to total aggregates:

<u>Coarse Aggregate Size</u>	<u>Minimum Ratio</u>	<u>Maximum Ratio</u>
3/4"	0.35	0.50
1"	0.30	0.46

G. Initial set:

1. 5-1/2 hours  $\pm 1$  hr after water and cement are added to the aggregates as determined by ASTM C403.
2. Adjust retarder quantities to compensate for temperature and job condition variations.

H. Volumetric air content:

1. 6 percent  $\pm 1$  percent after placement.
2. Air entrainment admixture is required.

I. Admixtures:

1. Content, batching method, and time of introduction in accordance with the manufacturer's recommendations for compliance with this specification.
2. Include a water reducing admixture.
3. Calcium chloride is not permitted.
4. Superplasticizer may be required. A separate submittal and approval are required.
5. Color: Davis Color #160, Canyon for eastern portion of the project. Color for the west portion of the project should match existing.

J. Strength: Minimum compressive strength as determined by ASTM C39 for concrete structures:

<u>Age</u>	Concrete Structures Minimum Strength
7 days	2,500 psi
28 days	3,750 psi

K. Consistency:

1. Suitable for the placement conditions.
2. Slump uniform.
3. Aggregate floating uniformly throughout the concrete mass.

4. Flow sluggishly when vibrated or spaded.

## **2.8 (Not Used)**

## **2.9 SOURCE QUALITY CONTROL**

### **A. Test reports:**

1. Submit reports of tentative concrete mix design and testing including:
  - a. Slump on which the design is based.
  - b. Total gal of water per cu yd.
  - c. Brand, type, composition, and quantity of cement.
  - d. Brand, type, composition, and quantity of fly ash.
  - e. Specific gravity and gradation of each aggregate.
  - f. Ratio of fine to total aggregates.
  - g. Surface-dry weight of each aggregate per cu yd.
  - h. Brand, type, ASTM designation, active chemical ingredients and quantity of each admixture.
  - i. Air content.
  - j. Compressive strength based on 7 day and 28 day compression tests.
  - k. Time of initial set.
2. Submit suppliers certified fly ash test reports for each shipment delivered to concrete supplier.
  - a. Physical and chemical characteristics.
  - b. Certification of compliance with the specifications.
  - c. Signed by Contractor and concrete supplier.

## **PART 3 - EXECUTION**

### **3.1 (Not Used)**

### **3.2 (Not Used)**

## **3.3 INSTALLATION**

### **A. Forms:**

1. Design to produce hardened concrete to the shape, lines, and dimensions shown on the Drawings.
2. Conform to ACI 347 as modified herein.
3. Surfaces exposed to view.
  - a. Prefabricated plywood panel forms, job-built plywood forms, or forms lined with plywood or fiberboard.
  - b. Line specific areas with architectural form liner as shown on Drawings.
  - c. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
  - d. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
  - e. Maximum deviation from a true plane: 1/8-inch in 6 feet.

4. Plywood or lined forms are not required for surface (buried by backfill) not normally submerged or not normally exposed to view.
5. Other types of forms may be used:
  - a. For surfaces not restricted to plywood or lined forms.
  - b. As backing for form lining.
6. Provide forms above all extended footings.
7. When placing concrete against gravel or crushed rock not containing 25 percent minimum material passing a No. 4 sieve:
  - a. Provide polyethylene film to protect concrete from water loss.
  - b. Lap joints 4 inches.
8. Provide substantial forms sufficiently tight to prevent leakage of mortar.
9. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement.
10. Size and space walers, studs, internal ties and other form supports so proper working stresses are not exceeded.
11. Where the top of a wall will be exposed to weathering, stop form on at least one side at true line and grade.
12. Other locations to be finished to a specified elevation, slope, or contour, bring form to true line and grade and provide a wooden guide strip at the proper location in the forms for finishing the top surface with a screed or template.
13. Install form ties on exposed surfaces in uniformly spaced vertical and horizontal rows.
14. Provide chamfer strips.
  - a. To bevel salient edges and corners.
  - b. To bevel salient edges of equipment bases.
  - c. 3/4-inch bevel.
15. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads.
16. Leave shoring beneath beams and slabs in place and reinforce as required by construction equipment and materials.
17. Remove forms carefully to prevent surface gouging, corner or edge breakage and other damage.

**B. Reinforcing steel:**

1. Accurately position reinforcing steel on supports, spacers, hangers, or other reinforcing steel.
2. Secure with wire ties or suitable clips.
3. Except at contact splices, minimum clear distance between bars; the greater of:
  - a. Nominal diameter of bars.
  - b. 1.5 times maximum size of coarse aggregate.
  - c. 1-1/2 inch in columns.
  - d. 1-inch in beams.
  - e. 2 inches in other locations.
4. Where beam reinforcement is placed in 2 layers, place bars in upper layer directly above bars in lower layer.
5. Do not install reinforcement for beams and slabs that are supported by concrete columns until after the concrete for the column has been placed.
6. Fabricate in accordance with ACI 315 and ACI 318 except as specified or shown on Drawings.

7. Accurately formed.
8. Free from loose rust, scale, and contaminants that will reduce bond.
9. Splices:
  - a. As shown on the Drawings.
  - b. Do not weld or tack weld reinforcing steel except where specifically shown on Drawings.
  - c. Remove and replace steel upon which any unauthorized welding has been performed.
  - d. When splicing bars in tie beams subject to tensile loading, splice no more than half the bars within a length of 40 bar diameter and hook each spliced bar end 180 degrees.
10. Do not bend or rebend reinforcing steel at job site. Bending of steel in locations not shown on Drawings shall be cause for rejection of work.

C. Embedments:

1. Accurately position and securely anchor in forms all anchor bolts, casting, steel shapes, conduit, sleeves, masonry anchorages, and other materials to be embedded in concrete.
2. Anchor bolts:
  - a. Provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template.
  - b. Install a second nut on the other side of the form or template.
  - c. Adjust the nuts to hold the bolt rigidly in the proper position.
3. Clean embedments before installation.
4. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete.

D. Concrete:

1. Notify Owner's Representative not less than 24 hours in advance of the times and places at which Contractor intends to place concrete.
2. Predetermine limits at each pour.
3. Place all concrete within limits of pour in one (1) continuous operation.
4. Rigidly secure forms, reinforcing steel, water stops, and anchor bolts in proper position.
5. Remove all mud, water, and debris from space to be occupied by concrete.
6. Clean surfaces encrusted with dried concrete from previous concrete operations.
7. Bonding to hardened concrete:
  - a. Place new concrete on rough, clean, damp faces of existing concrete.
  - b. Remove surface mortar to expose aggregate.
  - c. Clean hardened concrete of all foreign substances, including curing compound.
  - d. Wash with clean water, and keep saturated for 24 hours preceding placement of fresh concrete.
  - e. Omit coarse aggregate from the first batch or batches of concrete placed on hardened concrete in wall and column forms.
  - f. The mortar puddle shall cover the hardened concrete to a depth of at least 2 inches at every point.
8. Conveying concrete:

- a. Convey to the point of final deposit by methods that will prevent separation or loss of ingredients.
  - b. Place concrete in final position without being moved laterally more than 5 feet.
10. Placing concrete:
- a. Place concrete in approximately horizontal layers of proper depth for proper compaction, not more than 2 feet.
  - b. Place subsequent layer while the preceding layer is still plastic.
  - c. Fill form at a rate not less than 2 ft/hr.
  - d. Do not allow concrete to free fall more than 4 feet in walls and columns.
  - e. Provide vertical construction joints as required to comply with these requirements and as shown on the Drawings.
  - f. Place and compact concrete in wall or column forms before placing any reinforcing steel in the system to be supported by the walls and columns.
  - g. Limit portions of columns and walls poured monolithically with floor on roof slabs to 6-foot vertical height.
  - h. Allow concrete in walls and columns to settle at least two (2) hours before concrete is placed in structural systems to be supported by the walls and columns.
  - i. Top finish concrete when thoroughly settled.
  - j. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping, or other effective means.
  - k. Overfill the forms for walls whose tops will be exposed to the weather and screed off the excess after the concrete has settled.
11. Compaction:
- a. Thoroughly compact concrete during and immediately after placement.
  - b. Work concrete around all reinforcements and embedments and into the corners of the forms.
  - c. Use mechanical vibrators which will maintain 9,000 cycles/min when immersed in the concrete, 1-1/2 HP motor min.
12. Cold weather concreting:
- a. Comply with ACI 306 and 306.1, except as modified herein.
  - b. Minimum concrete temperature at the time of mixing:
- | <u>Outdoor Temperature<br/>at Placement (in shade)</u> | <u>Concrete Temperature<br/>at Mixing</u> |
|--|---|
| Below 0° F   | 70° F                                     |
| Between 0° F & 30° F                                   | 65° F                                     |
| Between 30° F & 45° F                                  | 60° F                                     |
| Above 45° F  | 45° F                                     |
- c. Do not place heated concrete which is warmer than 80 degrees F.
  - d. If freezing temperatures are expected during curing, maintain the concrete temperature at or about 50 degrees F for five (5) days or 70 degrees F for three (3) days.
  - e. Do not allow concrete to cool suddenly.
  - f. Do not place concrete on frozen subgrade.
13. Hot weather concreting:
- a. Comply with ACI 305, except as modified herein.
  - b. If the air temperature is expected to be 90 degrees F or greater in the next 24 hours.



- 1) Keep concrete as cool as possible before, during, and after placement.
  - 2) Do not allow concrete temperature to exceed 70 degrees F at placement.
  - 3) Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
  - 4) Addition of ice, or other cooling methods, will be required to meet temperature requirements.
- c. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs/sq ft/hr as determined from ACI 305.

E. Construction joints:

1. Locations:

- a. As shown on the Drawings, and if not shown, joint spacing shall not exceed ACI recommendations as interpreted by the Owner's Representative.

F. Finishing unformed surfaces:

1. Do not finish buried or permanently submerged concrete not forming an integral part of a structure except as required to attain surface elevations, contours, and freedom from laitance.
2. Screed and initial float finish followed by additional floating, and troweling as required, all other surfaces.
3. Screeding:
  - a. Screed concrete surfaces to the proper elevation and contours with all aggregates completely imbedded in mortar.
  - b. Surface free of irregularities of height or depth more than 1/4 inch measured from a 10-foot straightedge.
4. Floating:
  - a. Float finish screeded surfaces as soon as the concrete has stiffened sufficiently for working.
  - b. Remove and replace with mortar any coarse aggregate which is disturbed by the float or which causes a surface irregularity.
  - c. Initial floating to produce a surface of uniform texture and appearance without unnecessary working of the surface.
  - d. Follow initial floating with a second floating at the time of initial set.
  - e. Second floating to produce a finish of uniform texture.
  - f. Except as otherwise specified, the second floating finish is the final finish.
  - g. Use hand floats or mechanical compactor floats.
5. Finish:
  - a. Broom finish exterior slabs.
  - b. Broom after second floating and at right angles to normal traffic.
  - c. Medium salt finish for all pathways.
6. Troweling:
  - a. Steel trowel finish interior floor surface which will be exposed at the completion of construction, the exposed portion of the equipment bases, interior curbs, and where shown on the Drawings.
  - b. Do not trowel floor surfaces which will be normally submerged.

- c. Trowel after the second floating when the surface has hardened adequately to prevent drawing an excess of fines to the surface.
  - d. Trowel to produce a dense, smooth, uniform surface free from blemishes and trowel marks.
7. Aggregate exposure:
    - a. Remove surface mortar from surfaces to be covered later with concrete or mortar topping.
    - b. Expose coarse aggregates to improve bonding.
  8. Unless specified to be beveled, edge floated or troweled surfaces with a tool having a 1/4-inch radius.

#### G. Curing:

1. Protect concrete from moisture loss for at least seven (7) days after placement except that the time period for curing by saturation for concrete being protected from low temperature shall be one day less than the duration of low temperature protection.
2. Cure concrete by methods that will keep concrete surfaces adequately wet during curing.
3. Water curing:
  - a. Begin water saturation as quickly as possible after initial set.
  - b. Regulate water application to provide complete surface coverage with a minimum of runoff.
  - c. Use absorptive blankets to hold moisture to concrete or flood the surface.
4. Membrane curing:
  - a. Membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or concrete where water curing is not specifically called for.
  - b. Spray apply membrane curing compound at not more than 300 sq ft/gal.
  - c. Cover unformed surfaces within 30 minutes of final finishing.
  - d. If forms are removed before the end of the curing period, immediately apply curing compound to the formed surfaces before they dry out.
  - e. Protect curing compound against abrasion during the curing period.
5. Film curing:
  - a. Polyethylene sheeting may be used in lieu of water curing on concrete which will be covered later with mortar or additional concrete, or will otherwise be covered or hidden from view where water curing is not specifically called for.
  - b. Begin film curing as quickly after initial set of the concrete as possible.
  - c. Completely cover the surfaces with polyethylene sheeting.
  - d. Overlap the sheeting edges for sealing and anchorage.
  - e. Seal joints between sheets.
  - f. Promptly repair tears, holes, and other damages.
  - g. Anchor covering continuously at edges and on the surfaces as required to prevent billowing

#### H. Finishing formed surfaces:

1. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed.

2. Use a power grinder, if necessary, to remove projections and provide a flush surface.
3. Remove fins and fill tie hole on surfaces to be dampproofed but do not do any other finishing of those surfaces.
4. Tie holes:
  - a. Clean, wet and fill with patching mortar.
  - b. Finish flush to match the texture of adjacent concrete.
5. Grout - cleaned finish:
  - a. ACI 301, 5.3.3.4.b.
  - b. Grout clean surfaces to produce a smooth uniform surface free of marks, voids, surface glaze, and cement dust.
  - c. Grout clean all surfaces exposed to view, interior of tanks and surfaces shown on Drawings.
  - d. Fill all voids regardless of location that are 1/4-inch deep or 1/2-inch diameter.

### **3.4 FIELD QUALITY CONTROL**

#### **A. Owner furnished:**

1. Perform field control test:
  - a. Tests by qualified personnel.
  - b. Make tests in presence of Owner's Representative.
  - c. Provide all equipment, supplies, and the services of one (1) or more employees, as required.
  - d. The test frequencies specified are minimum, perform additional tests as required by the job conditions.
2. Aggregate gradation: Sample and test in accordance with ASTM D75 and C136.
  - a. Fine aggregates: Each 100T.
  - b. Coarse aggregates: Each 200T.
3. Fly ash: Sample and test each 25T in accordance with ASTM C143.
4. Slump: perform a test for each truck load in accordance with ASTM C143.
5. Air content: Test a sample from one the first three batches made each day in accordance with ASTM C231.
6. Compression tests:
  - a. Make one (1) set of four (4) cylinders from each truck or day.
  - b. Test one (1) cylinder in each set at SEVEN (7) days.
  - c. Test two (2) cylinders in each set at 28 days.
  - d. The other cylinder is to be a spare to be tested at the Owner's Representative's discretion.
  - e. Owner's Representative will evaluate in accordance with ACI 214 and ACI 318.
  - f. Make cure, store, and deliver cylinders in accordance with ASTM C31.
  - g. Test in accordance with ASTM C39.
  - h. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump.

#### **B. Contractor furnished:**

1. Provide materials from each truck for test cylinders.
2. Cooperate with testing agency to provide test prior to placement of each load.
3. Provide all mix design testing.
4. Pay for all retesting of concrete which does not meet specifications during the initial test.

**END OF SECTION**

**SECTION 03055**  
**EPOXY BONDING REINFORCING BARS AND ALL THREAD RODS IN CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Bonding reinforcing bars and all thread rods in concrete using epoxy adhesive.
- B. Related Sections:
  - 1. Section 01410 - Regulatory Requirements.

**1.2 REFERENCES**

- A. American National Standards Institute (ANSI):
  - 1. Standard B212.15 - Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills.
- B. American Society for Testing and Materials (ASTM):
  - 1. C 881 - Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- C. ICC Evaluation Service, Inc.:
  - 1. Evaluation Report AC58 - Acceptance Criteria for Adhesive Anchors in Concrete and Masonry Elements specifications.
- D. SSPC - Society for Protective Coatings - Steel Structures Painting Council:
  - 1. SP-10 Near-White Blast Cleaning.

**1.3 SUBMITTALS**

- A. Product Data: Furnish technical data for epoxy adhesives, including installation instructions, independent laboratory test results, and handling and storage instructions.
- B. Quality Control Submittals:
  - 1. An agency approved by authorities having jurisdiction, Evaluation Report meeting AC58-Acceptance Criteria for Adhesive Anchors in Concrete Masonry Elements specifications.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Storage of Epoxy Components:
  - 1. Store epoxy components on pallets or shelving in a covered-storage area.

2. Control temperature above 60 degrees Fahrenheit and dispose of product if shelf life has expired.
3. If stored at temperatures below 60 degrees Fahrenheit, test components prior to use to determine if they still meet specified requirements.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Like Items of Materials: Use end products of one manufacturer in order to achieve structural compatibility and singular responsibility.

### **2.2 EPOXY ADHESIVE FOR SELF-CONTAINED CARTRIDGE SYSTEM**

- A. Meet ASTM C 881, Type IV, Grade 3, Class B or C depending on site conditions.
- B. Two-component, 100 percent solids, insensitive to moisture, and gray in color.
- C. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
- D. Container Markings: Include manufacturer's name, product name, and batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- E. Manufacturers: One of following or equal:
  1. Covert Operations, Long Beach, CA, CIA-Gel 7000 System.
  2. Hilti, Tulsa, OK, RE 500 High Strength Epoxy Doweling System.
  3. Simpson Strong-Tie Company, Inc., Pleasanton, CA, SET Epoxy-tie Anchoring System.

### **2.3 ALL THREAD RODS**

- A. Materials: 304 stainless steel.

### **2.4 REINFORCING BARS**

- A. Materials: As specified in Section 03301.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Provide Epoxy Adhesive Packaged as Follows:
  1. Disposable, self-contained cartridge system capable of dispensing both epoxy components in proper mixing ratio, and fit into a manually or pneumatically operated caulking gun.
  2. Dispense components through a mixing nozzle that thoroughly mixes components.

### 3.2 HOLE SIZING AND INSTALLATION

#### A. Drilling Holes:

1. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in existing concrete without acceptance by Owner's Representative.
2. The location of reinforcing bars or other obstructions shall be determined with a non-destructive indicator device.

#### B. Hole Drilling Equipment:

1. Electric or pneumatic rotary impact type with medium or light impact.
2. Drill Bits: Carbide-tipped in accordance with ANSI B212-15.
3. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.
4. Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

#### C. Hole Diameter: Reinforcing bar diameter or all thread rod diameter plus 1/8 inch.

#### D. Obstructions in Drill Path:

1. If an existing reinforcing bar or other obstruction is hit while drilling hole, stop drilling hole and fill hole with dry pack mortar. Relocate hole to miss obstruction and drill another hole. Repeat above until hole has been drilled to required depth.
2. Avoid drilling an excessive number of holes in an area of a structural member, which would excessively weaken structural member and endanger stability of structure. Drypack holes which hit obstructions and allow drypack to reach strength equal to existing concrete before drilling adjacent holes. Epoxy grout may be substituted for dry pack when acceptable to Owner's Representative.
3. When existing reinforcing steel is encountered during drilling and when acceptable to Owner's Representative, enlarge hole by 1/8 inch, core through existing reinforcing steel at larger diameter, and resume drilling at original hole diameter.
4. Bent Bar Reinforcing bars: Where edge distances are critical, and striking reinforcing steel is likely, and if acceptable to Owner's Representative, drill hole at 10 degree angle or less from axis of reinforcing bar or all thread rod being installed.

#### E. Install reinforcing bars and all thread rods to depth, spacings, and locations as indicated on Drawings.

#### F. Cleaning Holes:

1. Insert long air nozzle into hole and blow out loose dust. Use air that is free of oil, water, or other contaminants that will reduce bond.
2. Use a stiff bristle brush to vigorously brush hole to dislodge compacted drilling dust.
3. Repeat step 1.
4. Repeat above steps as required to remove drilling dust or other material that will reduce bond. The hole shall be clean and dry.

#### G. Cleaning Reinforcing Bars and All Thread Rods:

1. Degrease and sandblast reinforcing bars and all thread rods over embedment length to near-white metal in accordance with Steel Structures Painting Council, SP-10 finish. The reinforcing bars and all thread rods shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.

H. Filling Hole with Epoxy:

1. Fill hole with epoxy before inserting reinforcing bar or all thread rod. Fill hole with epoxy starting from bottom of hole. Fill hole without creating air voids.
2. Fill hole with sufficient epoxy so that excess epoxy is extruded out of hole when reinforcing bar or all thread rod is inserted into hole.
3. Do not install epoxy prior to receiving epoxy manufacturer's onsite training.

**3.3 MANUFACTURER'S SERVICES**

- A. Furnish manufacturer's representative to conduct jobsite training for proper installation, handling, and storage of epoxy, for personnel who will perform actual installation. Owner's Representative may attend training sessions.

**3.4 FIELD QUALITY CONTROL**

A. Testing Laboratory Hired by Contractor will:

1. Review epoxy manufacturer's recommended special inspection procedures.
2. Periodically inspect hole drilling operations for conformance with Contract Documents and manufacturer's recommendations.
3. Certify in writing to Owner's Representative that depth and location of holes conform to requirements in Contract Documents prior to placement of epoxy.
4. Continuously inspect placement of epoxy, and reinforcing bars installation.

B. Testing Laboratory will proof test reinforcing bars in tension after curing.

1. Test locations will be at Owner's Representative's discretion.
2. Load at failure shall be greater than proof test load, indicated on Drawings, for each reinforcing bar type.
3. No further placement of reinforcing bar type shall occur until proof tests are passed.
4. Should any reinforcing bar type fail to meet these criteria, notify Owner's Representative immediately. Retest additional reinforcing bars at direction of Owner's Representative.

C. Contractor shall replace failed reinforcing bars at direction of Owner's Representative at no additional cost.

D. Contractor shall pay for increased quality control testing and reinforcing bar replacement caused by reinforcing bar failure.

- E. Reinforcing bars which break off above surface of concrete or less than 2 inches below surface of concrete shall be cut off 2 inches below surface of concrete, and concrete shall be repaired.

F. The concrete shall be repaired where bars pull out of hole or break below surface of



concrete and spall concrete.

**END OF SECTION**

**SECTION 03600  
GROUT**

**PART 1 - GENERAL**

**1.01 SUMMARY**

A. Section includes:

1. Grouting of column and equipment baseplates.
2. Grouting of anchors and dowels into existing concrete.
3. Patching cavities in concrete.
4. Other grouting specified or shown on Drawings.
5. Topping in concrete tanks.

B. Related sections:

1. Additional requirements specified elsewhere:
  - a. Submittals Procedures: Section 01330
  - b. Material and Equipment: Section 00700
2. Related Work specified elsewhere:
  - a. Cast-In-Place Concrete: Section 03001

**1.02 REFERENCES**

A. References standards:

1. Corps of Engineers Specifications CRD-C-621: Specification for Non-Shrink Grout.
2. ASTM C-827: Hardened Volume Change.
3. ASTM C-307: Tensile Strength.
4. ASTM C-579: Compressive Strength.
5. ASTM C-882: Bond Strength.
6. ASTM C33: Concrete Aggregates.
7. ASTM C109: Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch or 50mm cube specimens).
8. ASTM C143: Test Method for Slump of Portland Cement Concrete.
9. ASTM C150: Portland Cement.
10. ASTM C172: Method of Sampling Freshly Mixed Concrete.
11. ASTM C231: Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260: Air-Entraining Admixtures for Concrete.
13. ASTM C494: Specification for Chemical Admixtures for Concrete.
14. ASTM C595: Blended Hydraulic Cements.
15. ASTM C827: Test Method for Early Volume Change of Cementitious Mixtures.
16. ACI 211.1: Standard Practice for Selecting Proportions for Normal and Heavyweight, and Mass Concrete.
17. ACI 301: Specifications for structural concrete.

**1.03 (Not Used)**

**1.04 (Not Used)**

**1.05 SUBMITTALS**

A. Product Data:

1. Copies of Manufacturer's specifications and installation instructions for all proprietary materials.
2. Certification that materials meet specification requirements.
3. For ordinary cement grout, submit copies of grout design mix and laboratory test reports for grout strength tests.

B. Quality control submittals:

1. Test reports: Submit proportioning mix design report.

**1.06 QUALITY ASSURANCE**

- A. Compliance with the requirements specified herein may necessitate modification to Manufacturer's standard material or equipment.

**1.07 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver and store material in Manufacturer's original, unopened, undamaged containers.
- B. Store in dry areas protected from moisture and wet weather.
- C. Store away from traffic areas.

**1.08 PROJECT/SITE CONDITIONS**

- A. **(Not Used)**

**PART 2 - PRODUCTS**

**2.01 (Not Used)**

**2.02 MATERIALS**

- A. Non-shrinking non-metallic grout: Master Builders "MF-928 Grout;" W. R. Meadows "588 Grout;" U. S. Grout "Five Star Grout, 100 Series;" or equal.
1. Factory pre-mixed requiring only water addition in the field.
- B. Epoxy grout:

1. Adhesive: Master Builders "Ceilcote HT648 Grout," Minwax, "POR-ROK," Exxon Chem Co., "Escoweld 2505," Sika "Sikadur Hi-Mod," or equal.
  2. Aggregate: Master Builders "Ceilcote HT648," Exxon Chem Co., "Escoweld 2510," Sika "Colma Quartzite Aggregate," or equal.
  3. Three-component epoxy resin system.
    - a. Two (2) liquid epoxy components.
    - b. One (1) inert aggregate filler component.
  4. Each component furnished in separate package for mixing at job site.
- C. Water: Clean and free from deleterious substances.
- D. Ordinary cement-type grout: Prepare design mixes of ordinary cement grout. Mixes subject to the following limitations:
1. Cement:
    - a. Portland Cement, ASTM C150, Type II, or blended hydraulic cement, ASTM C595, Type 1P.
    - b. Use Portland Cement made by a well-known acceptable Manufacturer and produced by not more than one plant.
    - c. Do not use cement which has deteriorated because of improper storage or handling.
  2. Aggregates: ASTM C33 and as herein specified:
    - a. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces.
    - b. Fine aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
    - c. Coarse aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
      - 1) Crushed stone, processed from natural rock or stone.
      - 2) Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
      - 3) Coarse aggregate size: Size to be ASTM C33, No. 8 for coarse grout.
  3. Water: Clean, free from injurious amounts of oils, acids, alkalis, organic materials or other substances that may be deleterious to concrete or steel.
  4. Admixtures: Provide admixtures produced by established reputable Manufacturers, and use in compliance with Manufacturer's printed instruction. Do not use admixtures that have not been incorporated and tested in accepted mixes, unless otherwise authorized in writing by Owner's Representative. Provide admixtures as follows:
    - a. Air-entraining admixtures: Provide one of the following products and Manufacturer that meets ASTM C260:
      - 1) Sika AER by Sika Chemical Corporation.
      - 2) Micro-Air by Master Builders Company.
      - 3) Or equal.
    - b. Water-reducing admixture: Proportion all grout with non-air entraining, normal setting, water-reducing, aqueous solution of a modification of salt of polyhydroxylated organic acids. The admixture shall not contain any nitrates, or chlorides added during manufacture. Provide one (1) of the following that meets ASTM C494, Type A. Set-control

admixtures may be used where use of admixture will enhance placement of grout while maintaining required strength and durability:

- 1) Eucon WR-75 by the Euclid Chemical Company.
  - 2) Pozzolith 300-N by Master Builders Company.
  - 3) Or equal.
5. Proportioning and design of mixes: Mixes subject to the following limitations:
    - a. Coarse grout:
      - 1) Twenty-eight day compressive strength: 3,750 psi.
      - 2) Maximum water-cement ratio by weight: 0.45.
      - 3) Fine and coarse aggregate size No. 8 meeting ASTM C33.
      - 4) Air content percentage:  $6 \pm 1$  percent.
      - 5) Minimum cement content in pounds per cubic yard: 755.
  6. Use an independent testing company acceptable to Owner's Representative for preparing and reporting proposed mix designs.
  7. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on Work for grout required. Comply with ACI 211.1 and report to Owner's Representative the following data:
    - a. Complete identification of aggregate source of supply.
    - b. Tests of aggregates for compliance with specified requirements.
    - c. Scale weight of each aggregate.
    - d. Absorbed water in each aggregate.
    - e. Brand, type, and composition of cement.
    - f. Brand, type, and amount of each admixture.
    - g. Amounts of water used in trial mixes.
    - h. Proportions of each material per cubic yard.
    - i. Gross weight and yield per cubic yard of trial mixtures.
    - j. Measured slump.
    - k. Measured air content.
    - l. Compressive strength developed at seven (7) days and 28 days, from not less than three (3) test specimens cast for each 7-day and 28-day test, and for each design mix.
  8. Submit written reports to Owner's Representative of proposed mix of grout at least 30 days prior to start of Work. Do not begin grout production until mixes have been accepted by Owner's Representative.
  9. Laboratory trial batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301, Chapter 4 - Proportioning.
  10. Field experience method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301, Chapter 3.
  11. Admixtures: Use air-entraining admixture in all grout. Add air-entraining admixture at Manufacturer's prescribed rate to result in grout at point of placement having air content within prescribed limits. Use amounts of admixtures as recommended by Manufacturer for climatic conditions prevailing at time of placing. Adjust quantities and types of admixtures as required to maintain quality control. Do not use admixtures that have not been incorporated and tested in accepted design mix, unless otherwise authorized in writing by Owner's Representative.
  12. Slump limits: Proportion and design mixes to result in grout slump at point of placement of not more than four (4) inches.

### **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas and conditions under which grout is to be installed.
- B. Notify Owner's Representative of conditions detrimental to proper and timely completion of Work.
- C. Do not proceed with Work until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Non-shrinking, non-metallic grout:
  - 1. Clean concrete surface to receive grout.
  - 2. Saturate concrete with water for 24 hours prior to grouting.
  - 3. Place in accordance with Manufacturer's instructions.
- B. Epoxy grout:
  - 1. Mix and place in accordance with Manufacturer's instructions.
  - 2. Completely fill all cavities and spaces around dowels and anchors without voids.
  - 3. Grout base and baseplates as specified for non-shrinking, non-metallic grout.
  - 4. Obtain Manufacturer's field technical assistance as required to insure proper placement.

### **3.03 APPLICATION**

- A. Non-shrinking non-metallic grout:
  - 1. Use no more water than necessary to produce flowable grout.
  - 2. Place in accordance with Manufacturer's instructions.
  - 3. Completely fill all spaces and cavities below top of baseplates.
  - 4. Provide forms where baseplates and bedplates do not confine grout.
  - 5. Where exposed to view, finish grout edges smooth.
  - 6. Except where a slope is shown on Drawings, finish edges flush at baseplate, bedplate, member or piece of equipment.
  - 7. Wet cure grout for seven (7) days minimum.
  - 8. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
- B. Epoxy grout:
  - 1. Mix and place in accordance with Manufacturer's instructions.
  - 2. Completely fill all cavities and spaces around dowels and anchors without voids.

### **3.04 FIELD QUALITY CONTROL**

- A. General:

1. Owner will employ a testing laboratory to perform field quality control testing on ordinary cement-sand grout.
  2. Owner's Representative will direct number of tests and cubes required.
  3. The testing laboratory will make standard compression test cubes and entrained air tests as specified.
  4. Furnish all necessary assistance required by Owner's Representative.
- B. Quality control testing during construction:
1. Sampling and testing for field quality control will be performed by testing laboratory during placement of cement-sand grout, as follows:
    - a. Sampling Fresh Grout: ASTM C172.
    - b. Slump: ASTM C143; one (1) test for each grout load at point of discharge from vender's delivery vehicle; and one (1) for each set of compressive strength specimens.
    - c. Air content: ASTM C231; one (1) for every other grout load at point of discharge from vender's delivery vehicle, or when required by an indication of change as determined by Owner's Representative.
    - d. Compressive strength tests: ASTM C109; one (1) set of compression cubes for each 50 cubic yards or fraction thereof, of each mix design placed in any one (1) day or for each 2,500 square feet of surface area placed, whichever provides more cubes. Break one (1) specimen tested at seven (7) days; break two (2) specimens tested at 28 days; and break one (1) specimen tested at direction of Owner's Representative.
      - 1) Adjust mix if test results are unsatisfactory and resubmit for review.
      - 2) Grout that does not meet strength requirements is subject to rejection and removal from Work at expense of Contractor.
      - 3) The Contractor shall provide all samples required for testing at no additional costs to Owner.
    - e. Compression test specimens:
      - 1) ASTM C109; testing laboratory will take a minimum of one (1) set of four (4) standard cubes for each compressive strength test, unless otherwise directed by Owner's Representative.
    - f. Grout temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens is made. Comply with requirements of Section 03001 for Cold and Hot Weather Placement.
    - g. Shrinkage: ASTM C827.
  2. The testing laboratory will submit certified copies of test results directly to Owner's Representative, who will forward copies to Contractor.
- C. Evaluation of quality control tests:
1. Do not use grout delivered to final point of placement that has slump, temperature, or total air content outside specified values.
  2. Compressive strength tests for laboratory-cured cubes will be considered satisfactory if averages of all sets of three (3) consecutive compressive strength test results equal or exceed 28-day design compressive strength of type of grout.
  3. If compressive strength tests fail to meet minimum requirements specified, grout represented by such tests will be considered deficient in strength and subject to

removal, replacement, reconstruction, or to other action required, all at no additional cost to Owner.

**3.05 (Not Used)**

**3.06 (Not Used)**

**3.07 (Not Used)**

**3.08 (Not Used)**

**3.09 SCHEDULES**

- A. Non-shrinking, non-metallic grout: general use, baseplates, equipment bases, pipe entrance to precast vaults, pipe supports, etc., unless noted otherwise.
- B. Epoxy grout:
  - 1. Patching cavities in concrete.
  - 2. Grouting of dowels and anchor bolts into existing concrete.
  - 3. Other uses shown on Drawings.

**END OF SECTION**



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## **SECTION 04100**

### **MORTAR AND GROUT**

#### **PART 1: GENERAL**

##### **1.01 DESCRIPTION**

The work of this section consists of providing mortar and grout mixes for use with concrete masonry units.

##### **1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS**

- A. Section 03001: Cast In Place Concrete
- B. Section 04200: Concrete Masonry Units

#### **PART 2: MATERIALS**

##### **2.01 MATERIALS**

- A. Water used in mortar and grout shall be taken from a supply distributed for domestic purposes and at the time of mixing shall be clean and free of acids, alkalis, or other organic materials.
- B. The aggregate used in mortar shall conform to the "Standard Specifications for Aggregate for Masonry Grout ASTM Designation, C-144".
- C. The aggregate for masonry grout shall conform to the "Standard Specification for Aggregate for Masonry Grout ASTM Designation C-404-61T, Fine Aggregate Size No. 1".
- D. The cement shall conform to the Standard Specification for Portland Cement, ASTM Designation C-150, Type II Low Alkali. Masonry Cement will not be allowed.
- E. Hydrated Lime. The hydrated lime shall conform to the "Standard Specification for Normal Finishing Hydrated Lime, ASTM Designation C-207, Type S".
- F. Admixtures shall not be used in either mortar or grout except by written consent of the Engineer.

##### **2.02 MORTAR AND GROUT**

Mortar and grout shall conform to 2010 IBC.

#### **PART 3: EXECUTION**

##### **3.01 SURFACE PREPARATION**

Concrete areas to be in contact with mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond between the mortar or grout and the concrete surfaces. The surfaces shall be flushed with water and allowed to dry to a surface dry condition immediately prior to placing the mortar or grout.

### **3.02 MORTAR**

- A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5 minutes, approximately 2 minutes of which shall be for mixing the dry materials and not less than 3 minutes for mixing the mortar after the water has been added. When hydrated lime is used for mortar requiring a lime content, either the dry-mix method or first converting the hydrated lime into a putty may be used. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious material has been thoroughly distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.
- B. Mortar boxes shall be cleaned out at the end of each day's work, and all tools shall be kept clean. Mortar that has begun to set shall not be used.

### **3.03 GROUT**

- A. Grout may be placed in the reinforced hollow concrete block wall after the units have been set for at least 24 hours.
- B. Grout shall be placed by grout pump, concrete hopper or bucket.
- C. Grout spaces shall not be wet prior to pouring grout.
- D. Unless otherwise indicated the grout shall have a 9 inch to 11 inch slump.

### **3.04 PLACEMENT**

- A. Mortar and grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, and under structural members.
- B. Grouting, jointing and pointing of mortar used for reinforced hollow concrete block shall conform to Section 04200.

### **3.05 CURING**

After placing, any surfaces of mortar or grout shall be kept damp for a period of not less than 3 days.

### **3.06 SPECIAL INSPECTION**

Special inspection is not required unless shown on the Drawings.

END OF SECTION

## **SECTION 04200**

### **CONCRETE MASONRY ASSEMBLIES**

#### **PART 1: GENERAL**

##### **1.01 DESCRIPTION**

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to construct all masonry work as shown on Drawings and/or as specified herein.
- B. The work under this section includes, but is not necessarily limited to, the following:
  - 1. Concrete masonry units (CMU).
  - 2. Grouting and Mortar required.
  - 3. Expansion joints in masonry.
- C. The work shall also include setting and incorporating into masonry of all bolts, anchors, metals, attachments, nailing blocks, inserts, and so forth as shown on Drawings.

##### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 03001: Concrete
- B. Section 04100: Mortar and Grout
- D. Section 05500: Metal Fabrications
- E. Section 07920: Caulking & Sealants
- F. Division 8: Doors
- G. Division 9: Finishes

##### **1.03 SAMPLES**

- A. Submit to Owner's Representative for selection and approval, samples of CMU in various shades of color.
- B. Resubmit as required until approved.

##### **1.04 PROTECTION OF MATERIALS**

- A. All perishable materials for work of this Section shall be delivered, stored, and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from Site.
- B. All masonry shall be shipped, stacked with hay or straw protection or other suitable protective device, and shall be similarly stacked off ground on Site. In addition, all masonry stored on site

shall be protected from weather and staining with use of tarpaulins or other covering approved by Owner's Representative.

## **PART 2: PRODUCTS**

### **2.01 MATERIALS - MASONRY**

- A. Concrete masonry units (CMU) shall conform to ASTM C90, lightweight, Type I, hollow, load bearing open end units of 8 inches x 16 inches nominal face size and bed dimension as shown on Drawings. Maximum weights of individual units shall be 30 pounds.
- B. CMU shall be free from substances that will cause staining or pop-outs, and shall be fine, even texture with straight and true edges. All units shall have been wet steam cured for at least 18 hours and then air cured in covered storage for not less than 28 days before delivery.
- C. Units shall be obtained from one manufacturer to insure even color and texture.
- D. Provide special units required by Drawings, including solid, corner, pilaster, lintels, open ended, and jamb units.
- E. All concrete blocks shall have a minimum net tensile strength of not less than 135 psi.
- F. Concrete blocks shall have been air cured for not less than 28 days or equivalent.
- G. All concrete blocks shall have a maximum moisture content per Table 1 of ASTM C90 for mean relative humidity at Site per map in appendix of ASTM C90 and linear shrinkage of block as determined by ASTM C426.
- H. Concrete bar reinforcement in sizes No. 3 (3/8 inch) and larger shall be deformed steel bars of sizes and shapes shown on Drawings. The steel shall be newly rolled stock of domestic manufacture, substantially free from mill scale, rust, dirt, grease, or other foreign matter. Bars shall be of intermediate grade, deformed billet steel conforming to ASTM Specification A615, including Supplementary Requirement S1, Grade 40 for sizes 3 and smaller, Grade 60 for sizes 4 and larger.

## **PART 3: EXECUTION**

### **3.01 MASONRY - INSTALLATION**

- A. Masonry shall not be laid at temperatures below 40 degrees F, without approval of Owner's Representative, and all work shall be done in such a manner as to insure proper and normal hardening of all mortar. All masonry work shall be so protected and heated that temperature at surface will not fall below 50 degrees F for a period of 72 hours after placing. Any completed work found to be affected by freezing shall be taken down and rebuilt by Contractor at his expense.
- B. All CMU shall be laid in a full bed of mortar, applied to shells only. Butter vertical joint of unit already set in wall and all contact faces of unit to be set. Each unit shall be placed and shoved against unit previously laid so as to produce a well-compacted vertical mortar joint for full shell thickness. Units shall set with all cells in a vertical position. The moisture content of units when laid shall not exceed 35 percent of total absorption as determined by laboratory test.
- C. CMU shall be laid in stretcher (running) bond with units machine sawn at panel ends to produce

proper bonding as approved. Tool dense and neat.

- D. Sizes shall be as specified and called for on Drawings, and where "Soaps" and "Splits" are used, space between these members and backup material shall be slushed full of mortar.
- E. Joints of all masonry shall be tooled in accordance with the following:
  - 1. Wait until unit mortar is thumb-print hard before tooling joint. This may require as much as 3 hours in shade and 1 hour in sun in summertime.
  - 2. The required personnel of Contractor shall be kept on job after hours, if necessary, to properly tool joints.
  - 3. Both vertical and horizontal joints shall be maintained uniform in spacing.
  - 4. Joints for CMU shall be 3/8-inch. Exterior and interior and vertical and horizontal joints shall be concave rodded.
- F. Install all frames required to be set in masonry, set masonry tightly against frames, build in all frame anchors, and fill frames with mortar.
- G. All masonry slots, chases, or openings required for proper installation of Work of other Sections shall be constructed as shown on Drawings or in accordance with information furnished before work is started at points affected. No chase shall cut into any wall constructed of hollow units after it is built, except as directed and approved by Owner's Representative.
- H. Surfaces shall be brushed as work progresses and maintained as clean as it is practicable. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind and before continuing work previously laid shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by frost or elements by means of waterproof paper, tarpaulins, boards or other means approved by Owner's Representative.
- I. The Contractor shall build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds, and exterior electric conduits and fixtures, and shall cooperate with other trades whose work is to be coordinated with work under this section.
- J. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
- K. All ties and reinforcing for masonry shall be furnished and installed by Contractor.
- L. Bed and grout all steel, for equipment and machinery, and items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates, and seats in masonry walls, and build in all items required for completion of building as they apply to masonry.

### **3.03 CLEANING**

- A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and re-pointed with mortar of same color as that of original and adjoining work.
- B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off surfaces as work progresses.

- C. All exposed masonry shall be thoroughly cleaned. Before applying any cleaning agent to entire wall, it shall be applied to a sample wall area of approximately 20 square feet in a location approved by Owner's Representative. No further cleaning work may proceed until sample area has been approved by Owner's Representative, after which time same cleaning materials and method shall be used on remaining wall area. If stiff brushes and water do not thoroughly clean surface of unglazed masonry, on which no green efflorescence appears, the surface shall be thoroughly wetted with clear water and then scrubbed with a solution of not more than 1 part hydrochloric (muriatic) acid to 9 parts water, followed immediately by a thorough rinsing with clear water. If masonry is cleaned with an acid solution, all sash, metal lintels and other corrodible parts shall be thoroughly protected. Green efflorescence shall be removed in accordance with manufacturer's recommendations.

END OF SECTION



**SECTION 04860  
STONE VENEER ASSEMBLIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes stone in the following applications:
  - 1. Amphitheater seating, fire ring, and similar Project applications.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
  - 1. For stone varieties proposed for use on Project, include data on physical properties **specified or required by referenced ASTM standards**.
- B. Stone Samples: For each color, grade, finish, and variety of stone required.
- C. Colored Mortar Samples: For each color required.

**1.3 QUALITY ASSURANCE**

- A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.

**1.4 PROJECT CONDITIONS**

- A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in **ACI 530.1/ASCE 6/TMS 602**.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

**PART 2 - PRODUCTS**

**2.1 STONE SOURCES**

- A. Varieties and Sources: Subject to compliance with requirements, provide one of the following stone varieties from the following source:
  - 1. Full-size local stone, generally varying shades of brown and gray with some gold and rust, or equal. Available locally from Syar Industries, Inc. Napa, CA. (707) 252-8711.
  - 2. Thickness: The thickness of stone may vary based on location of placement.
  - 3. Size: The face shall be random sizes 6" to 18" composed of the following percentages by size: 6" – 8": 25%; 8" – 12": 50%; 12" – 18": 25%.
- B. Provide stone that complies with the following physical characteristics:
  - 1. Maximum Absorption, by Weight: 7.5 percent according to ASTM C 97.
  - 2. Minimum Compressive Strength: 4000 psi according to ASTM C 170.

## 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
  - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: **ASTM C 207**, Type S.
- C. Masonry Cement: **ASTM C 91**.
- D. Aggregate: ASTM C 144 and as follows:
  - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
- E. Mortar Pigments: Natural or synthetic iron oxides, compounded for use in mortar mixes and with a record of satisfactory performance in stone masonry mortars.
  - 1. Products:
    - a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
    - b. Davis Colors; True Tone Mortar Colors.
    - c. Lafarge Corporation; Centurion Pigments.
    - d. Solomon Colors; SGS Mortar Colors.
- F. Water: Potable.

## 2.3 VENEER ANCHORS

### A. Materials:

1. Hot-Dip Galvanized Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.
2. Hot-Dip Galvanized Steel Sheet: ASTM A 366/A 366M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.

### B. Wire Veneer Anchors: Formed from W1.7 or 0.148-inch- diameter wire.

## 2.4 MISCELLANEOUS MASONRY ACCESSORIES

### A. Asphalt Dampproofing for Concrete Backup: Cut-back asphalt complying with ASTM D 4479, Type I, or asphalt emulsion complying with ASTM D 1227, Type III or IV.

### B. Weep Holes:

1. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity behind stone veneer assembly.

## 2.5 MASONRY CLEANERS

### A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry-measure tetrasodium polyphosphate and 1/2-cup dry-measure laundry detergent dissolved in 1 gal. of water.

## 2.6 STONE FABRICATION

### A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.

### B. Shape stone for type of masonry (pattern) as follows:

1. Uncoursed rubble (fieldstone).

### C. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

1. Finish: **rock face.**
2. Finish for Sills: **Split face with sand-rubbed finish on washes.**
3. Finish for Lintels: **Rock face (pitched face).**
4. Finish for Copings: **Split faces**

- a. Finish exposed ends of copings same as front and back faces.

## 2.7 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride.
  - 2. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Mortar for Stone Masonry: Comply with **ASTM C 270**.
  - 1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
  - 2. Mortar for Setting Stone: Type **N**.
  - 3. Mortar for Pointing Stone: Type **N**.

## **PART 3 - EXECUTION**

### **3.1 SETTING OF STONE VENEER, GENERAL**

- A. Arrange stones for good fit in **uncoursed** rubble pattern with joint widths within tolerances indicated. **Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.**
- B. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than **3/8 inch** at narrowest points nor more than **1 inch** at widest points.

### **3.2 CONSTRUCTION TOLERANCES**

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet.
- B. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

### **3.3 INSTALLATION OF ADHERED STONE VENEER ASSEMBLIES**

- A. Coat backs of stone units and face of **masonry backup** with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and **masonry backup**.
- B. Rake out joints for pointing with mortar to depth of not less than **1/2 inch**. Rake joints to uniform depths with square bottoms and clean sides.

### 3.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
  - 1. Joint Profile: **Smooth, flat face slightly below edges of stone.**

### 3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner.
  - 4. Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

### 3.6 EXCESS MATERIALS AND WASTE

- A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
  - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

**END OF SECTION**

**SECTION 05500  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
1. Loose bearing and leveling plates.
  2. Loose steel lintels.
  3. Shelf angles.
  4. Miscellaneous steel framing and supports.
  5. Miscellaneous steel trim.
  6. Structural-steel door frames.
  7. Metal floor plate.
  8. Pipe guards.
  9. Pipe bollards.

**1.2 SUBMITTALS**

- A. Product Data: For the following:
1. Grout.
- B. Shop Drawings: Include plans, elevations, sections, details of installation, and attachments to other Work.
- C. Templates: For anchor bolts.

**PART 2 - PRODUCTS**

**2.1 METALS**

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  2. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
  3. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
  4. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
  5. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
  6. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
  7. Slotted Channel Framing: Cold-formed metal channels 1-5/8 by 1-5/8 inches with flange edges returned toward web and with 9/16-inch- wide slotted holes in webs at 2 inches o.c. Channels made from galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33, with G90 coating; 0.079-inch nominal thickness.

8. Iron Castings: ASTM A 47, Grade 32510 malleable iron or ASTM A 48, Class 30 gray iron.
9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

C. Aluminum:

1. Extrusions: ASTM B 221, alloy 6063-T6.
2. Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.

## 2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664 and compatible with finish paint systems indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Carboline Company; Carboline 621.
  - b. PPG Industries, Inc.; Aquapon Zinc-Rich Primer 97-670.
  - c. Tnemec Company, Inc.; Tneme-Zinc 90-97.

B. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.

## 2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls, of type, grade, and class required by application indicated.

B. Non-shrink, Nonmetallic Grout: ASTM C 1107, factory-packaged, non-staining, noncorrosive, nongaseous grout.

C. Concrete Fill: Comply with requirements in Division 3 Section 03001 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

## 2.4 FABRICATION

A. Connections, General: Use connections that maintain structural value of joined pieces.

1. Shear and punch metals cleanly and accurately. Remove burrs.
2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
3. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes.

4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- B. Loose Bearing and Leveling Plates: Fabricate loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
1. Galvanize plates after fabrication.
- C. Loose Steel Lintels: Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
1. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.
- D. Miscellaneous Framing and Supports: Fabricate steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work from structural steel of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.
1. Where indicated to be cast into concrete or built into masonry, equip with integrally welded anchors at 24 inches o.c.
  2. Fabricate steel girders for wood frame construction from continuous steel shapes. Where wood nailers are attached to girders with bolts or lag screws, drill holes at 24 inches o.c.
  3. Fabricate steel pipe columns for supporting wood frame construction with steel baseplates and top plates welded to pipe with fillet welds the same size as pipe wall thickness.
- E. Miscellaneous Steel Trim: Fabricate units with continuously welded joints and smooth exposed edges. Miter corners and use concealed splices where possible. Fabricate cutouts, fittings, and anchorages; coordinate assembly and installation with other work.
- F. Structural-Steel Door Frames: Fabricate from structural shapes and bars fully welded together, with 5/8-by-1-1/2-inch steel channel stops secured with countersunk machine screws. Reinforce frames and drill and tap as necessary to accept finish hardware.
1. Fabricate with steel strap anchors, with a minimum 6-inch embedment, welded to frame jambs no more than 12 inches from both bottom and head of frame, and not more than 30 inches apart.
  2. Galvanize exterior frames.

## **2.5 FINISHES**

- A. Finish metal fabrications after assembly. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Shop prime ferrous-metal items not indicated to be galvanized.
1. Hot-dip galvanize items indicated to be galvanized to comply with ASTM A 123 or ASTM A 153/A 153M as applicable.



2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
3. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Provide anchorage devices and fasteners for securing metal fabrications to in-place construction. Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
  1. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
  2. Fit exposed connections accurately together. Weld connections, unless otherwise indicated. Do not weld, cut, or abrade galvanized surfaces.
- B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack with non-shrink, nonmetallic grout.
- C. Bollards:
  1. Anchor in concrete with pipe sleeves preset and anchored into concrete.
- D. Touch up surfaces and finishes after erection.
  1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.
  2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

**END OF SECTION**

**SECTION 06100  
ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. This Section includes the following:

1. Wood framing.
2. Wood supports.
3. Wood blocking.
4. Wood cants.
5. Wood nailers.
6. Wood furring.
7. Wood grounds.
8. Wood sheathing.
9. Wood subflooring.
10. Wood underlayment.
11. Plywood backing panels.
12. Building wrap.

**1.2 SUBMITTALS**

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

B. Research/Evaluation Reports: For the following:

1. Treated wood.
2. Engineered wood products.
3. Foam-plastic sheathing.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.
8. Building wrap.

**PART 2 - PRODUCTS**

**2.1 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.

**2.2 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Provide dressed lumber, S4S, unless otherwise indicated.
  - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
  
- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable Design Stresses: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
  
- C. Wood Structural Panels:
  - 1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
  - 2. Oriented Strand Board: DOC PS 2.

### **2.3 WOOD-PRESERVATIVE-TREATED MATERIALS**

- A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
  
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
  
- C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
  
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  - 3. Wood framing members less than 18 inches above grade.
  - 4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

### **2.4 FIRE-RETARDANT-TREATED MATERIALS**

- A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
  - 2. Use treatment that does not promote corrosion of metal fasteners.
  - 3. Use Exterior type for exterior locations and where indicated.
  - 4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

## **2.5 DIMENSION LUMBER**

- A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 2, Standard, grade and either of the following species:
  - 1. Northern species; NLGA.
  - 2. Western woods; WCLIB or WWPA.
- C. Framing Other Than Non-Load-Bearing Partitions: Construction, Stud, or No. 2 grade and any of the following species:
  - 1. Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; NLGA, WCLIB, or WWPA.
  - 2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
  - 3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
- D. Exposed Framing: Hand select material for uniformity of appearance and freedom from characteristics that would impair finish appearance.
  - 1. Species and Grade: As indicated above for load-bearing construction of same type.

## **2.6 TIMBER AND MISCELLANEOUS LUMBER**

- A. For timbers of 5-inch nominal size and thicker, provide material complying with the following requirements:
  - 1. Species and Grade: Douglas fir-larch, Douglas fir-larch, or Douglas fir; Select Structural or No. 1 grade; NLGA, WCLIB, or WWPA.
- B. Provide miscellaneous lumber for support or attachment of other construction, including the following:
  - 1. Rooftop equipment bases and support curbs.
  - 2. Blocking.

3. Cants.
  4. Nailers.
  5. Furring.
  6. Grounds.
- C. For items of dimension lumber size, provide No. 1 grade lumber with 19 percent maximum moisture content of any species.
- D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Northern species, No. 2 Common grade; NLGA.
  2. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

## **2.7 ENGINEERED WOOD PRODUCTS**

- A. Laminated-Veneer Lumber: Composite of wood veneers with grain primarily parallel to member lengths, manufactured with exterior-type adhesive complying with ASTM D 2559. Allowable design values determined according to ASTM D 5456.
1. Manufacturers:
    - a. Boise Cascade Corporation.
    - b. Georgia-Pacific Corporation.
    - c. Louisiana-Pacific Corporation.
    - d. Pacific Woodtech Corp.
    - e. Trus Joist MacMillan.
    - f. Willamette Industries, Inc.
  2. Extreme Fiber Stress in Bending, Edgewise: 2500 psi for 12-inch nominal- depth members.
  3. Modulus of Elasticity, Edgewise: 1,800,000 psi.
- B. Wood I-Joists: Prefabricated units complying with APA PRI-400; depths and performance ratings not less than those indicated.
1. Manufacturers:
    - a. Boise Cascade Corporation.
    - b. Georgia-Pacific Corporation.
    - c. Louisiana-Pacific Corporation.
    - d. Pacific Woodtech Corp.
    - e. Poutrelles International Inc.
    - f. Standard Structures Inc.
    - g. Stark Truss Company, Inc.
    - h. Superior Wood Systems, Inc.
    - i. Trus Joist MacMillan.
    - j. Willamette Industries, Inc.
  2. Web Material: Plywood, Exposure 1 or Plywood, Exterior grade.
  3. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.

4. Trademark: Factory mark I-joists with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and I-joist compliance with APA standard.

## **2.8 SHEATHING**

- A. Plywood Wall Sheathing: Exterior, Structural I, sheathing.
- B. Plywood Roof Sheathing: Exterior, Structural I, sheathing.
- C. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

## **2.9 PLYWOOD BACKING PANELS**

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

## **2.10 MISCELLANEOUS MATERIALS**

- A. Fasteners:
  1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
  2. Power-Driven Fasteners: CABO NER-272.
  3. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- B. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
  1. Manufacturers:
    - a. KC Metals Products, Inc.
    - b. Silver Metal Products, Inc.
    - c. Simpson Strong-Tie Company, Inc.
    - d.
    - e. United Steel Products Company, Inc.
  2. Research/Evaluation Reports: Provide products acceptable to the Owner for which code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with codes in effect for Project.
  3. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; and complying with ASTM E 1677, Type I.

1. Manufacturers:
    - a. Celotex Corporation (The); Building Products Division.
    - b. DuPont (E. I. du Pont de Nemours and Company).
    - c. Parsec, Inc.
    - d. Raven Industries, Inc.
    - e. Reemay, Inc.
    - f. Simplex Products.
    - g. Sto-Cote Products, Inc.
    - h. Tenneco Building Products.
  2. Thickness: Not less than 3 mils.
  3. Permeance: Not less than 10 perms.
  4. Flame-Spread Index: 25 or less per ASTM E 84.
  5. Allowable Exposure Time: Not less than three months.
- D. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.
- E. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.
- F. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- G. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  1. CABO NER-272 for power-driven fasteners.
  2. Published requirements of metal framing anchor manufacturer.
  3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the California Building Code.

- D. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- E. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- F. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- G. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
- H. Fastening Methods:
  - 1. Combination Subfloor-Underlayment: Glue and nail to wood framing.
  - 2. Subflooring: Glue and nail to wood framing.
  - 3. Sheathing: Nail or staple to wood framing.
  - 4. Plywood Backing Panels: Nail or screw to supports.
- I. Building Wrap Application: Cover wall sheathing with building wrap as indicated. Cover upstanding flashing with 4-inch overlap. Seal seams, edges, and penetrations with tape.
- J. Apply sheathing tape to joints between sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

**END OF SECTION**



**SECTION 06200  
FINISH CARPENTRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Standing and running trim.
  - 2. Stairs and railings.
  - 3. Paneling.

**1.2 SUBMITTALS**

- A. Product Data: For each type of factory-fabricated product and process indicated.
- B. Samples: For the following:
  - 1. Each type of finish required.
  - 2. Each type of paneling required.
  - 3. Each type of siding required.

**PART 2 - PRODUCTS**

**2.1 MATERIALS, GENERAL**

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee Board of Review.
- B. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."
- C. Hardwood Plywood: Comply with HPVA HP-1, "Interim Voluntary Standard for Hardwood and Decorative Plywood."
- D. Preservative Treatment: Comply with NWWDA I.S. 4 for exterior finish carpentry to receive water-repellent preservative treatment.
- E. Fire-Retardant Treatment: Where indicated, use materials impregnated with fire-retardant chemicals per AWPA C20; exterior type or interior Type A as required.

**2.2 STANDING AND RUNNING TRIM**

- A. Exterior Standing and Running Trim: Finished lumber and moldings.
  - 1. Species and Grade: Select sugar pine, western white pine, or fir, WWPA.
- B. Primed Hardboard Trim: Fabricated from high-temperature-cured, high-resin, wood fiber composite; factory primed on face and two edges; and recommended by manufacturer for exterior use.

- C. Interior Standing and Running Trim: Finished lumber and moldings.
  - 1. Species and Grade or Cut: C Select, eastern white pine; NELMA or B & Btr. Select or Supreme, Idaho white, lodgepole, ponderosa, or sugar pine; WWPA.
- D. Shelving: 3/4-inch particleboard shelving with radiused and filled front edge.

## **2.3 SIDING**

- A. 06300 – Cementitious Siding

## **2.4 MISCELLANEOUS MATERIALS**

- A. Fasteners for Exterior Finish Carpentry: Provide nails of hot-dip galvanized steel, or non-corroding aluminum.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours.
- B. Prime and backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 9 Section 09960 "Coatings."

### **3.2 INSTALLATION**

- A. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts.
- B. Standing and Running Trim: Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.
- C. Paneling: Install according to manufacturer's written recommendations. Select and arrange units on each wall for best match of adjacent units where grain character or color variations are noticeable. Install with uniform tight joints between units.
- D. Siding: Install siding and flashing according to manufacturer's written recommendations. Do not allow nails to penetrate more than one thickness of siding, unless otherwise recommended by siding manufacturer. Seal joints at inside and outside corners and at trim locations.
- E. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

**END OF SECTION**



**SECTION 07462  
CEMENTITIOUS SIDING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Fiber cement lap siding, panels, single, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.
- B. Factory-finished fiber cement lap siding, panels, single, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

**1.2 RELATED SECTIONS**

- A. Section 06100 - Rough Carpentry: Wood framing and bracing.
- B. Section 07210 - Insulation: Exterior wall insulation.

**1.3 REFERENCES**

- A. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- B. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

**1.4 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Minimum of 2 years of experience with installation of similar products.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.8 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
  - 1. HardiPanel HZ10 vertical siding for 30 years.
  - 2. HardieTrim HZ10 boards for 15 years.
- B. Finish Warranty: Limited product warranty against manufacturing finish defects.
  - 1. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.
- C. Workmanship Warranty: Application limited warranty for 2 years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Fax: 949-367-4981; Email: [request info \(info@jameshardie.com\)](mailto:request_info@jameshardie.com); Web: [www.jameshardiecommercial.com](http://www.jameshardiecommercial.com)
- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

### 2.2 SIDING

- A. HardiePlank HZ10 lap siding, HardiPanel HZ10 vertical siding, HardieSoffit HZ10 panels and HardieShingle HZ10 siding requirement for Materials:
  - 1. Fiber-cement Siding - complies with ASTM C 1186 Type A Grade II.
  - 2. Fiber-cement Siding - complies with ASTM E 136 as a noncombustible material.
  - 3. Fiber-cement Siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
  - 4. CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.
  - 5. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI, IBC, IRC).
  - 6. US Department of Housing and Urban Development Materials Release 1263d
  - 7. California DSA PA-019.
- B. Vertical Siding: HardiePanel HZ10 siding as manufactured by James Hardie Building Products, Inc.
  - 1. Type: Cedarmill Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
- C. Trim:
  - 1. HardieTrim HZ10 boards as manufactured by James Hardie Building

- Products, Inc.
- a. Product: Batten Boards, 2-1/2 inch (63 mm) width.
- b. Product: 4/4 Boards, 3-1/2 inch (89 mm) width.
- c. Texture: Wood Grained.
- d. Length: 12 feet (3658 mm).
- e. Thickness: 3/4 inch (19 mm).
- 2. HardieTrim HZ10 Fascia boards as manufactured by James Hardie Building Products, Inc.

### **2.3 FASTENERS**

- A. Wood Framing Fasteners:
  - 1. Wood Framing: 6d common corrosion resistant nails.

### **2.4 FINISHES**

- A. Factory Primer: Provide factory applied universal primer.
  - 1. Primer: Factory primed by James Hardie.
  - 2. Topcoat: Refer to Section 09900 and Exterior Finish Schedule.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Nominal 2 inch by 4 inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
  - 1. Install water-resistive barriers and claddings to dry surfaces.
  - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
  - 3. Protect siding from other trades.

### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements.
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- E. Install Engineered for Climate™ HardieWrap™ weather barrier in accordance with local building code requirements.
- F. Use HardieWrap™ Seam Tape and joint and laps.
- G. Install and HardieWrap™ flashing, HardieWrap™ Flex Flashing.

### **3.3 INSTALLATION - HARDIEPANEL HZ10 VERTICAL SIDING**

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Block framing between studs where HardiePanel siding horizontal joints occur.
- C. Install metal Z flashing and provide a 1/4 inch (6 mm) gap at horizontal panel joints.
- D. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
- E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- F. Maintain clearance between siding and adjacent finished grade.
- G. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
- H. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
  - 1. Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
  - 2. Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
  - 3. Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

### **3.4 INSTALLATION - HARDIETRIM HZ10 BOARDS**

- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with a single board trim both side of corner.
- F. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
- G. Allow 1/8 inch gap between trim and siding.
- H. Seal gap with high quality, paint-able caulk.
- I. Shim frieze board as required to align with corner trim..
- J. Install HardieTrim Fascia boards to rafter tails or to sub fascia.

### **3.5 FINISHING**

- A. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

### **3.6 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**



**SECTION 07115  
BITUMINOUS DAMP-PROOFING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes cold-applied, emulsified asphalt damp-proofing.

**1.2 SUBMITTALS**

- A. Product Data: For each product indicated.

**PART 2 - PRODUCTS**

**2.1 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.

**2.2 BITUMINOUS DAMP-PROOFING**

- A. Odor Elimination: For interior and concealed-in-wall uses provide damp-proofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.
- B. Cold-Applied, Emulsified-Asphalt Damp-proofing:
  - 1. Trowel Coats: ASTM D 1227, Type II, Class 1.
  - 2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
  - 3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
  - 4. **[Available ]**Manufacturers:
    - a. Euclid Chemical Company (The).
    - b. Gardner Asphalt Corporation.
    - c. Henry Company.
    - d. Karnak Corporation.
    - e. Koppers Industries, Inc.
    - f. Malarkey Roofing Company.
    - g. Meadows, W. R., Inc.
    - h. Sonneborn, Div. of ChemRex, Inc.
    - i. Tamms Industries.

**2.3 MISCELLANEOUS MATERIALS**

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- C. Protection Course, Asphalt-Board Type: Pre-molded, 1/8-inch- thick, multi-ply, semi-rigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.
  - 1. Available Manufacturers:
    - a. Grace, W. R. & Co.; Construction Products Div.
    - b. Meadows, W. R., Inc.
    - c. Sonneborn, Div. of ChemRex, Inc.
- D. Protection Course, Polystyrene Type: Fan-folded, rigid, extruded-polystyrene board insulation; nominal thickness not less than 3/16 inch.
- E. Protection Course, Roll-Roofing Type: Smooth-surfaced roll roofing complying with ASTM D 224, Type II.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION, GENERAL**

- A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- B. Apply damp-proofing to footings and foundation walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
  - 1. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of damp-proofing. Damp-proofing coat required for embedding fabric is in addition to other coats required.
- C. Apply damp-proofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.
- D. Apply damp-proofing to provide continuous plane of protection on exterior concrete and concrete masonry walls unless walls are indicated to receive direct application of paint.
- E. Use cold-applied, emulsified-asphalt damp-proofing on any surface indicated to receive damp-proofing.

### **3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMP-PROOFING**

- A. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, one fibered brush or spray

coat at not less than 3 gal./100 sq. ft., or one trowel coat at not less than 4 gal./100 sq. ft..

- B. On Unparged Masonry Foundation Walls: Apply primer and one trowel coat at not less than 5 gal./100 sq. ft..
- C. On Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft.
- D. On Interior Face of Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..

### **3.3 INSTALLATION OF PROTECTION COURSE**

- A. Where indicated, install protection course over completed-and-cured damp-proofing. Comply with damp-proofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

**END OF SECTION**

## **SECTION 07210 BUILDING INSULATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Roof thermal insulation.
  - 2. Ceiling thermal insulation.
  - 3. Wall sound insulation.
  - 4. Wall rigid insulation.

#### **1.2 SUBMITTALS**

- A. Product Data: For each product indicated, including certification of recycled material content.
- B. Product test reports.
- C. Research/evaluation reports.

#### **1.3 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
- B. Thermal resistance factors (R-values) listed are aged values tested in accordance with ASTM C518 at 75 degrees Fahrenheit and 50 percent relative humidity for at least six months.
- C. Insulation shall be certified by the manufacturer to comply with California standards for insulating materials.

### **PART 2 - PRODUCTS**

#### **2.1 Insulation Materials**

- A. General Requirements:
  - 1. Provide insulating materials, where exposed to the interior of the building, the attic space, or where no other material is installed directly against the face of the insulation, with a Flame Spread rating of at least 25, as per the reference standards.
  - 2. Width of material, if not listed, shall be of largest practical width to fit tightly against or between the framing members where the insulation is installed.
- B. Batt Insulation
  - 1. Faced fiberglass batt insulation

- a. Post-consumer recycled content: minimum 30%.
  - b. Facing: Provide foil faced, flame spread 25, with extended flanges if necessary for proper installation, when installed at roof with no finish material installed against insulation.
  - c. Manufacturers: Owens Corning, Toledo, OH (800/438-7465), Johns Manville, Inc., Denver, CO (800/654-3103), CertainTeed, Valley Forge, PA (800/441-9850) or equal.
  - d. R value at roof:
2. Unfaced fiberglass batt insulation
- a. Post-industrial recycled content: minimum 30%.
  - b. Manufacturers: Owens Corning, Toledo, OH (800/438-7465), Johns Manville, Inc., Denver, CO (800/654-3103), CertainTeed, Valley Forge, PA (800/441-9850) or equal.
  - c. R value at ceiling:
3. Unfaced fiberglass batt sound insulation.
- a. Post-consumer recycled content minimum 30%.
  - b. Manufacturers: Owens Corning, Toledo, OH (800/438-7465), Johns Manville, Inc., Denver, CO (800/654-3103), CertainTeed, Valley Forge, PA (800/441-9850) or equal.
  - c. Size of batts: Width as required to friction fit between studs. Thickness shall be 3 1/2".

C. Rigid Board Insulation

1. Expanded Polystyrene (EPS)
- a. Recycled content: minimum 15%
  - b. Manufacturers: Insulfoam, Aurora, CO (5-15% recycled content) (800/735-4621); no known equal.
  - c. Manufacturing Process: foaming agents shall be HCFC- free, CFC- free.
  - d. Application: Roofs; concrete slabs and below grade.
2. Extruded Polystyrene (XPS)
- a. Recycled content: minimum 5%
  - b. Manufacturers: AmoFoam RCX-50, Tenneco Foam Products (50% recycled content), Atlanta, GA (800/241-4402),
  - c. Manufacturing process: foaming agents shall be CFC- free.
  - d. Application: Roofs; concrete slabs and below grade.
3. Polyurethane
- a. Recycled content: minimum 5 %
  - b. Manufacturers: generic.
  - c. Manufacturing process: CFC- free.
  - d. Application: Roofs; concrete slabs and below grade.
4. Perlite composition board
- a. Recycled content: minimum 25%
  - b. Products: Gaftemp Permalite by BMCA Insulation Products, Inc., Ontario, CA (800/766-3411); Fesco Board by Johns Manville International, Inc., Denver, CO (800/654-3103)

- c. Application: Roofs.

## 2.2 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Protection Board: Pre-molded, semi-rigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, of standard sizes.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

## 2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors with Washers: **[Plate]** **[Angle]** formed from perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square, welded to projecting steel spindle with a diameter of 0.105 inch and length capable of holding insulation of thickness indicated securely in position with 1-1/2- inch-square or diameter self-locking washers complying with the following:
  - 1. Washers formed from 0.016-inch-thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than in place.
  - 2. Where anchors are located in **[ceiling plenums]** **[crawlspaces]** **[attic spaces]** provide capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.
- B. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain **[1-inch]** **[2-inch]** **[3-inch]** air space between face of insulation and substrate to which anchor is attached.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install insulation to comply with insulation manufacturer's written instructions applicable to products and application indicated. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- B. Install perimeter insulation on vertical surfaces by setting units in adhesive.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

2. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board set in adhesive.
- C. Protect top surface of perimeter under slab insulation from damage during concrete work by applying protection board.
- D. Install cavity wall and masonry cell insulation as follows:
1. Install foam plastic insulation with small pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside the wythe of masonry or other construction as shown.
    - a. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 4 Section 04810 "Unit Masonry Assemblies". Install cellular glass insulation by applying insulation with closely fitting joints using **[gob] [serrated trowel]** method per cellular glass insulation's written directions and as follows:
    - b. Coat exterior face (cold face) of installed cellular glass block insulation course with asphalt coating recommended by insulation manufacturer for this purpose.
- E. Pour granular insulation into cavities indicated to receive insulation, taking care to fill voids completely. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close ports after confirming complete coverage. Limit fall of insulation to one story in height, but not exceeding 20 feet.
- F. Installation of General Building Insulation: Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
1. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant.
  2. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
    - a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
    - b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  3. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:

- a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
  4. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
  5. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.
  6. Place loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
  7. For cellulose loose-fill insulation, comply with the Cellulose Insulation Manufacturers Association's "Special Report #3, "Standard Practice for Installing Cellulose Insulation."
  8. Apply self-supported, spray-applied, cellulose insulation according to manufacturers written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it even with studs by using method recommended by insulation manufacturer.
  9. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- G. Installation of Vapor Retarders: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
1. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
  2. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
  3. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.
  4. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
  5. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

**END OF SECTION**



**SECTION 07610  
SHEET METAL ROOFING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following sheet metal roofing:
  - 1. Corrugated Steel Roofing.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Wind-Uplift Resistance: Capable of producing sheet metal roofing assemblies that comply with UL 580 for Class 90 wind-uplift resistance.

**1.3 SUBMITTALS**

- A. Product Data: For each type of underlayment product indicated.
- B. Shop Drawings: Show layouts of sheet metal roofing, including plans, elevations, and keyed references to termination points.
  - 1. Include details for forming, joining, and securing sheet metal roofing, including pattern of seams, termination points, expansion joints, roof penetrations, edge conditions, special conditions, connections to adjoining work, and accessory items.
- C. Coordination Drawings: Drawn to scale and coordinating sheet metal roofing installation with penetrations and roof-mounted items.

- D. Product test reports.

**1.4 QUALITY ASSURANCE**

- A. Inspection: Contact State's Representative at least 48 hours in advance so Representative may review substrate before installation of Roofing.

**PART 2 - PRODUCTS**

**2.1 2-1/2" Corrugated Panel**

- A. Panel Description: 26" wide with 1" overlap, 24" coverage corrugations 2-1/2 wide, 1/2" high. Materials: Minimum 26 ga., 80 ksi steel. Galvanized coated steel (ASTM A653) or Galvanized steel sheet, G90, conforming to ASTM A446
- B. Deck Description: Min. 19/32" thick plywood for new constructions. Designed and installed as per IBC 2010.

## 2.2 Deck Attachment

- A. 8d x 2.5" long ring shank nails or #8 x 2" long wood screws @ 6" o.c. in plywood field and edges

## 2.3 Panel Attachment:

- A. #9-15 x 1.5" long wood screw with washer at panel ends @ 5.25" o.c. across panel width at intermediate @ 10.625" o.c. across panel width

## PART 3 - EXECUTION

### 3.1 Surface Conditions

- A. Inspection:
  - 1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
  - 2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.
- B. Discrepancies:
  - 1. In event of discrepancy, notify Owner's Representative.
  - 2. Do not proceed with installation until discrepancies have been resolved.

### 3.2 Installation

- A. Install panels so that they are weather tight, without waves, warps, buckles, fastening, stresses or distortion, allowing for expansion and contraction.
- B. Install panels in accordance with manufacturer's installation instructions and shop drawings.
- C. Install panels plumb, level, and straight with seams and ribs/battens parallel, conforming to design as indicated.

### 3.3 Cleaning, Protection

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to satisfaction of Owner's Representative, any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions.

- E. At completion of each day's work and at work completion, sweep panels and flashing clean. Do not allow fasteners, cuttings, filings or scrapes to accumulate on finished surfaces

### 3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weather tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete sheet metal roofing assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 2. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

### 3.5 CLEANING AND PROTECTION

#### 3.6 Cleaning, Protection

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to satisfaction of Owner's Representative, any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions.
- E. At completion of each day's work and at work completion, sweep panels and flashing clean. Do not allow fasteners, cuttings, filings or scrapes to accumulate on finished surfaces

**END OF SECTION**

**SECTION 07620  
SHEET METAL FLASHING AND TRIM**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Formed low-slope roof flashing and trim.
  - 2. Formed steep-slope roof flashing and trim.
  - 3. Formed wall flashing and trim.

**1.2 SUBMITTALS**

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.

**1.3 QUALITY ASSURANCE**

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- B. Acceptance of Substrate: Prior to installation of Sheet Metal Flashing and Trim, substrate must be approved by Contractor. Installation of Sheet Metal Flashing and Trim constitutes acceptance of substrate by Subcontractor.
- C. Inspection: Contact Owner's Representative at least 48 hours in advance so Representative may review substrate before installation of Sheet Metal Flashing and Trim.

**PART 2 - PRODUCTS**

**2.1 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 Work include, but are not limited to, Manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of Manufacturers specified.

**2.2 SHEET METALS**

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

## 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
- C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
  - 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, and polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

## 2.4 REGLETS

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory- mitered and -welded corners and junctions.
  - 1. Available Manufacturers:
    - a. Cheney Flashing Company, Inc.
    - b. Fry Reglet Corporation.
    - c. Heckmann Building Products Inc.
    - d. Hickman, W. P. Company.
    - e. Keystone Flashing Company, Inc.
    - f. Sandell Manufacturing Company, Inc.
  - 2. Material: Galvanized steel, 0.0217 inch thick.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

## 2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
  - 1. Fabricate from the following material:
    - a. Galvanized Steel: 0.0336 inch thick.
- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
  - 1. Fabricate downspouts from the following material:
    - a. Galvanized Steel: 0.0217 inch thick.

## 2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following material:
  - 1. Galvanized Steel: 0.0217 inch thick.
- B. Drip Edges: Fabricate from the following material:
  - 1. Galvanized Steel: 0.0217 inch thick.
- C. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0217 inch thick.

## 2.8 WALL SHEET METAL FABRICATIONS

- A. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams. Fabricate from the following material:
  1. Galvanized Steel: 0.0217 inch thick.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or Manufacturers of dissimilar metals.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
  1. Galvanized or Pre-painted, Metallic-Coated Steel: Use stainless-steel fasteners.
- H. Seal joints with sealant as required for watertight construction.

- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-terminated edges of sheets to be soldered to a width of 1-1/2 inches except where pre-terminated surface would show in finished Work.

### 3.2 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
  1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

### 3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.
  1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.
  1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch spacing.
  2. Anchor interior leg of coping with screw fasteners and washers at 18-inch spacing.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Secure in a waterproof manner. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:



1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

#### 3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches] beyond wall openings.

**END OF SECTION**

**SECTION 08114  
CUSTOM STEEL DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Steel doors.
  - 2. Steel door frames.
  - 3. Louvers in doors.

**1.2 SUBMITTALS**

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
  - 1. Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Steel Products Corp.
  - 2. Amweld Building Products, Inc.
  - 3. BRS Products.
  - 4. Ceco Door Products.
  - 5. Curries Company.
  - 6. Deronde Products, Inc.
  - 7. Emerson Engineering, Co., Inc.
  - 8. Firedoor Corporation of Florida.
  - 9. Fleming, S. W. Limited.
  - 10. Habersham Metal Products Co.
  - 11. Karpen Steel Custom Doors & Frames.
  - 12. Kewanee Corporation.
  - 13. LaForce, Inc.
  - 14. National Custom Hollow Metal Doors & Frames.
  - 15. Next Door Company.
  - 16. Pioneer Industries.

17. Precision Metals, Inc.
18. Security Metal Products, Inc.
19. Steelcraft; a division of Ingersoll-Rand.
20. Tex-Steel Corporation.
21. Therma-Tru Corp.; HMF Division.

## **2.2 MATERIALS**

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, commercial steel (CS), Type B; pickled and oiled. Thickness indicated is minimum thickness according to HMMA 803, Steel Tables.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, commercial steel (CS), Type B. Thickness indicated is minimum thickness according to HMMA 803, Steel Tables.
- C. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, zinc coat according to ASTM A 153/A 153M, Class C or D as applicable.

## **2.3 DOORS**

- A. General: Flush-design, 1-3/4 inches thick, of seamless hollow construction, unless otherwise indicated.
  1. Single-Acting Swing Doors: Bevel vertical edges 1/8 inch in 2 inches.
  2. Double-Acting Swing Doors: Round vertical edges with 2-1/8-inch radius.
- B. Metallic Core: Welded to both door faces, one of the following indicated.
  1. Unitized Grid Core: 0.042-inch- thick, formed-steel inner structure with sound deadener applied to inside surfaces of face sheets.
  2. Steel-Stiffened Core: 0.026-inch steel vertical stiffeners extending full-door height, spaced not more than 6 inches apart and spot welded to face sheets a maximum of 6 inches o.c. Fill spaces between stiffeners with insulation of minimum 0.6-lb/cu. ft. density or sound deadener applied to inside surfaces of face sheets.
  3. Continuous Truss-Form Inner Core: 0.013-inch- thick steel reinforcement spot welded to face sheets a maximum of 3 inches o.c. vertically and horizontally.
- C. Nonmetallic Core: Laminated with waterproof adhesive to both door faces, of construction indicated.
  1. Honeycomb Core: Resin-impregnated kraft paper with maximum 1-inch cells and minimum 42-psi crushing strength.
  2. Polyurethane Core: Minimum 20-psi compressive strength and not less than 1.8-lb/cu. ft. density foamed-in-place or rigid board polyurethane.
  3. Polystyrene Core: Minimum 0.9-lb/cu. ft. density with not less than 18-psi shear strength, rigid, foam polystyrene core board complying with ASTM C 578, Type I.
- D. Top and Bottom Channels: Spot weld metal channel not less than thickness of face sheet to face sheets not more than 6 inches o.c.

1. Reinforce tops and bottoms of doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets.
  2. For exterior doors, close bottom edge with metallic-coated steel closing channel and top edge with filler channel of same material, so webs of channels are flush with bottom and top door edges.
- E. Hardware Reinforcement: Fabricate reinforcing plates from same material as door to comply with the following:
1. Hinges and Pivots: 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  2. Lock Face, Flush Bolts, Closers, and Concealed Holders: 0.093 inch thick.
  3. All Other Surface-Mounted Hardware: 0.053 inch thick.
- F. Exterior Doors: Fabricate face sheets of doors from 0.053-inch- thick, stretcher-leveled, metallic-coated steel sheets. Provide weep-hole openings in bottom of doors to permit entrapped moisture to escape. Seal joints in top edges of doors against water penetration.

## **2.4 FRAMES**

- A. General: Full-welded unit construction, with corners mitered, reinforced, and continuously welded full depth and width of frame.
1. Exterior Frames: Formed from 0.067-inch- thick, metallic-coated steel sheets.
  2. Interior Frames: Formed from cold- or hot-rolled steel sheet of the following thicknesses:
    - a. Openings up to and Including 48 Inches Wide: 0.053 inch.
    - b. Openings More Than 48 Inches Wide: 0.067 inch.
- B. Hardware Reinforcement: Fabricate from same material as frame. Minimum thickness of steel reinforcing plates for hardware as follows:
1. Hinges and Pivots: 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  2. Strikes, Flush Bolts, and Closers: 0.093 inch.
  3. Surface-Mounted, Hold-Open Arms and Panic Devices: 0.093 inch.
- C. Mullions and Transom Bars: Closed or tubular mullions and transom bars. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.
- D. Head Reinforcement: Where installed in masonry, leave vertical mullions in frames open at top for grouting.
- E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

- F. Jamb Anchors: Weld jamb anchors to frames near hinges and directly opposite on strike jamb.
  - 1. Masonry Construction: Formed of same material as frame; not less than 0.053 inch thick; with leg not less than 2 inches wide by 10 inches long.
    - a. Two anchors per jamb up to 60 inches in height.
    - b. Three anchors per jamb from 60 to 90 inches in height.
    - c. Four anchors per jamb from 90 to 96 inches in height.
    - d. One additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
- G. Floor Anchors: For each jamb and mullion that extends to floor, formed of same material as frame, 0.067 inch thick, as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.
  - 2. Separate Topping Concrete Slabs: Adjustable type with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
- H. Head Anchors: 2 head anchors for frames more than 42 inches wide and mounted in steel-stud walls.
- I. Structural Reinforcing Members: Installed as part of frame assembly, where indicated.
- J. Head Reinforcement: For frames more than 48 inches wide in masonry wall openings, continuous steel channel or angle stiffener, 0.093 inch thick for full width of opening, welded to back of frame at head.
- K. Spreader Bars: Removable, located across bottom of frames, tack welded to jambs and mullions.
- L. Rubber Door Silencers: Except on weather-stripped doors, drill stop in strike jamb to receive three silencers on single-door frames and drill head jamb stop to receive two silencers on double-door frames. Install plastic plugs to keep holes clear during construction.
- M. Plaster Guards: 0.016-inch- thick guards or dust-cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation.

## **2.5 FABRICATION**

- A. Fabricate doors and frames rigid, neat in appearance, and free of defects, warp, or buckle. Weld exposed joints continuously and grind smooth. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

- B. Exposed Fasteners: Provide countersunk flat or oval heads for exposed screws and bolts.
- C. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, fabricate doors and frames as thermal-insulating assemblies, tested according to ASTM C 236 or ASTM C 976.
  - 1. Provide thermal-rated assemblies with U-factor of 0.3 Btu/sq. ft. x h x deg F unless otherwise indicated.
- D. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A115 Series specifications for door and frame preparation for hardware.
  - 1. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Site.
  - 2. Locate hardware as indicated or, if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
- E. Hardware: Provide stainless steel hinges, door stops, threshold and striker.
- F. Lockset
  - 1. General: Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release latch. Locks shall not require use of a key, tool, or special knowledge for operation.
  - 2. Medium duty commercial, ANSI 156.2, 1996, Series 4000, Grade 2, 6 pin tumbler.
  - 3. Exposed Trim: stainless steel. Lever is zinc based.
  - 4. Keying. Key all door same.
  - 5. Schlage A-series Orbit, 613 finish.

## 2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for cleaning, treating, priming and, when specified, finishing.
- B. Finish products specified in this Section after fabrication.
- C. Metallic-Coated Steel Finishes:
  - 1. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.
    - a. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20.

2. Factory Priming for Field-Painted Finish: Immediately after surface preparation, apply fast-curing, lead- and chromate-free, primer complying with ANSI A224.1 compatible with finish coat indicated. Apply smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
3. Factory-Applied Finish: Immediately surface preparation, apply two-coat, air-dried-enamel, baked-enamel, or polyester finish complying with ANSI A250.3. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.25 mils for topcoat.
  - a. Color and Gloss: As selected from manufacturer's full range.

D. Steel Sheet Finishes:

1. Surface Preparation: SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Factory Priming for Field-Painted Finish: Immediately after surface preparation, apply fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer, ANSI A224.1, compatible with finish coats indicated. Apply smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
3. Factory-Applied Finish: Immediately surface preparation, apply two-coat, air-dried-enamel, baked-enamel, or polyester finish complying with ANSI A250.3. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.25 mils for topcoat.
  - a. Color and Gloss: As selected from manufacturer's full range.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Install doors and frames according to DHI A115.IG and manufacturer's written instructions.
- B. Frames:
  1. Set masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.
    - a. Set anchorage devices according to anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.
  2. Floor anchors may be set with powder-actuated fasteners.
  3. Placing Frames: Set frames accurately in position; plumb; align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
    - a. At existing concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices.
    - b. At fire-rated openings, install frames according to NFPA 80.

- c. Field splice only at approved locations. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
- C. Doors: Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
  - 1. Jambs and Head: 3/32 inch.
  - 2. Meeting Edges, Pairs of Doors: 1/8 inch
  - 3. Bottom: 3/8 inch, unless otherwise indicated.
- D. Fire-Rated Doors: Install with clearances as specified in NFPA 80.
- E. Smoke Control Doors: Install according to NFPA 105.
- F. Touchup: Immediately after erection, touchup finish to match undamaged finish.

**END OF SECTION**



**SECTION 08561  
VINYL WINDOWS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes **fixed and operable** vinyl framed windows.

**1.2 PERFORMANCE REQUIREMENTS**

- A. General: Provide vinyl windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of test size required by AAMA/WDMA 101/I.S.2/NAFS.
- B. Structural Performance: Provide vinyl windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
  - 1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet (10 m) above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
    - a. Basic Wind Speed: **90 mph**
    - b. Importance Factor: **IV**.
    - c. Exposure Category: **C**.
- C. Windborne-Debris Resistance: Provide glazed windows capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed windows identical to those specified, according to **ASTM E 1886 and testing information in ASTM E 1996** and requirements of authorities having jurisdiction.

**1.3 SUBMITTALS**

- A. Product Data: For each type of vinyl window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances, and installation details.
- C. Product Schedule.
- D. Product test reports.
- E. Maintenance data.

## 1.4 QUALITY ASSURANCE

- A. Installer: A qualified installer, approved by manufacturer to install manufacturer's products.
- B. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of vinyl, other materials, and finishes beyond normal weathering.
    - e. Failure of insulating glass.
  - 2. Warranty Period:
    - a. Window: **Three** years from date of Substantial Completion.
    - b. Glazing: **Five** years from date of Substantial Completion.
    - c. Vinyl Finish: **Five** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 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:

### 2.2 WINDOW

- A. Window Type: Sliding.
- B. Comply with AAMA/WDMA 101/I.S.2/NAFS.
  - 1. Performance Class and Grade: As indicated.
- C. For thermal performance according to AAMA 1503, showing a CRF of **45**.

- D. Thermal Transmittance: Provide vinyl windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to **AAMA 1503**.
1. U-Factor: **0.35 Btu/sq. ft. x h x deg. F (2.0 W/sq. m x K) or less.**
- E. Solar Heat-Gain Coefficient (SHGC): Provide vinyl windows with a whole-window SHGC maximum of **0.40**, determined according to NFRC 200 procedures.

### 2.3 GLAZING

- A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed vinyl window units.
- B. Glass: [Clear, insulating-glass units] [Clear, insulating-glass units, with low-E coating pyrolytic on second surface or sputtered on second or third surface,] [Clear, insulating-glass units, argon gas filled, with low-E coating pyrolytic on second surface or sputtered on second or third surface,] complying with Division 8 Section "Glazing."
- C. Glazing System: [Manufacturer's standard factory-glazing system that produces weather-tight seal.] [Manufacturer's standard factory-glazing system that produces weather-tight seal and complies with requirements for windborne-debris resistance.] [Manufacturer's standard factory-glazing system as indicated in Division 8 Section "Glazing."].

### 2.4 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on [**inside**] [**outside**] of window and provide for each operable exterior sash or ventilator.
1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," **Residential R-20** class.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
  2. Finish: **Anodized aluminum** in manufacturer's standard color.
  3. Finish: **Anodized aluminum** in color selected by Owner's Representative from manufacturer's full range.
  4. Finish: Manufacturer's standard.
- C. Glass-Fiber Mesh Fabric: **18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm)** mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh

resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration, in the following color. Comply with ASTM D 3656.

1. Mesh Color: **Charcoal gray** or **Silver gray**.
- D. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.
1. Wire-Fabric Finish: **Natural bright, Charcoal gray, or Black**.
- E. Wickets: Provide **sliding or hinged** wickets, framed and trimmed for a tight fit and for durability during handling.

## 2.5 ACCESSORIES

- A. Dividers (False Muntins): Provide dividers in designs indicated for each sash lite, **one per sash, removable from the exposed surface of interior lite of the sash, two per sash, removable from the exposed surfaces of interior and exterior lites of the sash, and one permanently located between glazing lites in the airspace.**
1. Material: **Extruded, rigid PVC** or **Aluminum**.
  2. Design: **Rectangular or Diamond**.
  3. Color: **White** or **Beige**.

## 2.6 FABRICATION

- A. Fabricate vinyl windows that are reglazable without dismantling sash or ventilator framing.
- B. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- C. Mullions: Provide mullions and cover plates as shown, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units. Provide manufacturer's standard finish to match window units.
- D. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- (1.6-mm-) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Provide manufacturer's standard finish to match window units. Provide subframes capable of withstanding design loads of window units.
- E. Glazing Stops: Provide nailed or snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

## 2.7 VINYL FINISHES

- A. Integral Finish and Color: Uniform, solid, homogeneous **white or beige** interior and exterior.
- B. Organic Pigmented Finish: Manufacturer's standard finish, interior and exterior, complying with **AAMA 613 or AAMA 615** and paint manufacturer's written specifications for cleaning and painting.
  - 1. Color: **As selected by Owner's Representative from manufacturer's full range.**

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- F. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- G. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- H. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

**END OF SECTION**

**SECTION 09250  
GYPSUM WALLBOARD**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section also includes:
1. Gypsum Wallboard
  2. Cementing and taping.
  3. Cementitious seals required where wallboard construction abuts sprayed fireproofing, metal decking and where otherwise specifically called for on Drawings.
  4. Joint sealers related to gypsum wallboard systems (sound retardant construction).
  5. Protection for recessed lighting fixtures in fire rated gypsum wallboard ceiling construction.

**1.2 SUBMITTALS**

- A. Product Data: Submit Manufacturer's product data and installation instructions for each component.

**1.3 QUALITY ASSURANCE**

- A. The following references, codes and standards are hereby made a part of this Section and gypsum wallboard work shall conform to applicable requirements therein except as otherwise specified herein or shown on Drawings. Nothing in Drawings or these Specifications shall be construed as permitting work which is contrary to code requirements.
1. "Recommended Specifications for the Application and Finishing of Gypsum Board" published by the Gypsum Association (GA-216-85).
- B. Store materials in protected dry storage areas. Neatly stack in flat position with suitable stickers to prevent sagging and contact with concrete slabs.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

For all gypsum wallboard work throughout Project, provide materials, including wallboard, accessories, fasteners, and finishing materials produced by one Manufacturer, unless noted otherwise. Acceptable Manufacturers are: USG, Georgia Pacific (GP) Gypsum, or equal.

**2.2 MATERIALS**

- A. Gypsum Wallboard: ASTM C36, 5/8" (16 mm) thickness unless otherwise noted. Material used in fire rated assemblies shall be Type X, UL labeled and approved as 1 hour fire resistive. Pieces to be 4 ft. (1200 mm) wide, maximum permissible lengths as required for minimum of end joints, ends square cut. Material to receive troweled finish, spray applied finish, or flexible coverings, shall have long edges tapered to receive Manufacturer's standard joint treatment.
  - 1. Recycled Content: Gypsum recycled content shall be a minimum of 10% post industrial content. Paper content to be 100% post consumer recycled content.
- B. Water Resistant (W-R) Gypsum Wallboard: ASTM C 30, 5/8" (16 mm) thickness unless otherwise noted, water resistant board. Material used in fire rated assemblies shall be Type X, UL labeled and approved as 1 hour fire resistive. Pieces to be 4 ft. (1200 mm) wide, maximum permissible lengths as required for minimum of end joints, ends square cut, long edges tapered to receive Manufacturer's standard joint treatment
- C. Gypsum Sheathing Board: ASTM C79, moisture resistant board, 1/2" (12 mm) thick, Type X, 24" or 48" (600 mm or 1200 mm) wide, maximum permissible lengths as required for minimum of end joints, ends square cut, long edges tongue and grooved, water repellent paper faces.
- D. Metal Edge Trim: USG 200-A, National Gypsum No. 100, or equivalent, where board edge is exposed; where edge is not exposed, USG 200-B, National Gypsum No. 200, or equivalent, may be used. Corner bead to be USG "Dur-A-Bead" #103, Gold Bond, or equal, 1-1/4" x 1-1/4" (32 mm x 32 mm).
- E. Control Joints: USG #093, Western, or equal.
- F. Aluminum Moldings: Fry Corp., or equal, extruded aluminum, profiles as indicated on Drawings, natural finish. Furnish in longest lengths possible to minimize joints.
- G. Fasteners: Metal screws as recommended by metal system Manufacturer and meeting ASTM C 1002. Use S-12 screws for 20 gage or heavier metal.
- H. Tape: ASTM C 475, perforated reinforcing tape, [fiberglass reinforcing tape where joining to adjacent existing plaster,] and fasteners.
  - I. Joint Compound: Provide compound in conformance with ASTM 475, as recommended by Manufacturer of gypsum products being used, for finish specified.
  - J. Laminating Adhesive: Provide adhesive specifically formulated for laminating gypsum wall board and as recommended by gypsum wallboard Manufacturer.
- K. Fasteners: Provide self piercing steel screws for installation of gypsum board to wood or cold-formed steel studs in conformance with ASTM C 1002.
  - 1. Type S: For fastening to cold formed steel studs.
  - 2. Type W: For fastening to wood members.

## **PART 3 - EXECUTION**

### **3.1 COORDINATION**

- A. Coordinate with other trades for provisions for insulation, blocking, metal backing plates, special anchors, etc., and ensure that such items are properly installed and located prior to installing wall finish.
- B. Coordinate with trades responsible for furnishing access doors with exact locations subject to Project Manager's approval.

### **3.2 MATERIALS HANDLING**

- A. Protect gypsum products from moisture and contaminants. Do not store near materials that may off gas harmful volatile organic compounds, such as solvents, kerosene, etc.

### **3.3 EXAMINATION**

- A. Inspect surfaces, backing, framing and furring systems, etc., to receive wallboard, and report any discrepancies. Starting work implies acceptance of existing conditions.

### **3.5 GYPSUM WALLBOARD INSTALLATION**

- A. General: Install gypsum wallboard with metal screws in conformance with requirements of the Gypsum Association Specifications GA.216.
- B. Install wallboard plumb, level, and/or plane.
  - 1. Layout panels to minimize waste; reuse cutoffs whenever feasible.
  - 2. Select panel sizes to minimize waste.
- C. Single Layer Gypsum Wallboard: Erect single layer gypsum wallboard in non-fire rated walls in most economical direction, with edges and ends on firm bearing. Neatly fit ends of edges where they abut. Erect single layer fire rated gypsum wallboard vertically, with edges and ends occurring over firm bearing.
- E. Water Resistant (WR) Gypsum Wallboard: Install where gypsum wallboard is used as a backing for ceramic tiles and in "wet" areas, or where WR is indicated. Install in same manner as regular gypsum wallboard. Treat cut edges and holes with sealant.
- F. Properly space fastenings as per Manufacturer's specifications and code requirements, with heads set slightly below surface for proper cementing, but without breaking paper covering. Loosely butt joints to be taped; firmly butt concealed joints to be left untreated. Stagger end joints and joints in finish material 12" (300 mm) min. with those in backing. Joints on opposite sides of partition shall occur on different studs. Install backing for finish material to present no surface imperfections in applied finish. Make holes and cutouts by sawing or by such method as will not fracture core or tear covering and with such



accuracy that plates, escutcheons, trim, etc., will cover edges. Clearance for cutouts in partitions shall not exceed 1/4".

- G. Install metal edge trim at exposed edges and ends and at untrimmed joints between wallboard finish and other material. Install corner bead at all outside corners. Where trim is required at wallboard edge, and headers, studs, sill or other backing are not available for positive fastening of trim, apply trim to board with contact type of adhesive.
- H. Provide in place approved protection for recessed light fixtures in fire rated ceilings. Fire protection may be hoods, blankets, wallboard or other material assembly permitted by Code.

### **3.7 TAPING AND CEMENTING**

Tape and cement gypsum wallboard in accord with Manufacturer's directions. Unless otherwise noted, finish shall be smooth sanded without imperfections, tool marks, etc. (3 coat min.). Tape and cement all wallboard. At sound insulated and air sealed construction, ensure that joints and voids between adjoining wallboard panels (including corner intersections) are filled solidly with compound prior to taping. Subcontractor's attention is directed to Reference Standard 1.02A(1) whereby wallboard surfaces to receive gloss type paints (other than "flat") shall receive a thin skim coat of joint compound. Such treatment shall be smooth sanded to provide a uniform surface for painting. Taping and cementing need not be finished for appearance where board serves as backing to other finish except that treatment shall not interfere with proper installation of finish or permit "telegraphing". [Wallboard to receive flexible wall covering materials shall be finished as for exposed painted surfaces.]

### **3.8 WASTE MANAGEMENT**

- A. Separate clean waste gypsum products from contaminants for recycling in accordance with Waste Management Plan. Do not include wood, plastic, metal, asphalt impregnated gypsum board or any gypsum board coated with glass fiber, vinyl, decorative paper, paint or other finish. Place in designated area and protect from moisture and contamination.
- B. Store scraps larger than 2 square feet for use in patching and small infill areas.
- C. Clean waste gypsum products shall be recycled by:
  - 1. Returning to gypsum board Manufacturer in lieu of landfill.
  - 2. Hauling to alternative use Manufacturer in lieu of landfill.
  - 3. Pulverize and apply on-site as soil amendment in accordance with landscape specifications. Do not use products containing glass fiber. Protect granular material from moisture.
- D. Separate metal waste, packaging and all other materials in accordance with Waste Management Plan and place in designated areas for recycling or reuse.

**END OF SECTION**

## **SECTION 09310 CERAMIC TILE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Glazed wall tile.
  - 2. Special-purpose tile.
  - 3. Waterproof membrane for tile installations.
  - 4. Cementitious backer units installed as part of tile installations.
  - 5. Metal edge strips installed as part of tile installations.

#### **1.2 SUBMITTALS**

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints.
- C. Samples:
  - 1. Each type, composition, color, and finish of tile.
  - 2. Assembled samples with grouted joints for each type, composition, color, and finish of tile.

#### **1.3 QUALITY ASSURANCE**

#### **1.4 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. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

## 2.2 TILE PRODUCTS

### A. Available Manufacturers:

1. American Marazzi Tile, Inc.
2. American Olean; Div. of Dal-Tile International Corp.
3. Buchtal Corporation USA.
4. Cerim-Floor Gres Ceramiche.
5. Crossville Ceramics Company, L.P.
6. Daltile; Div. of Dal-Tile International Inc.
7. Florida Tile Industries, Inc.
8. GranitiFiandre.
9. Interceramic.
10. KPT, Inc.
11. Laufen USA.
12. Lone Star Ceramics Company.
13. Metropolitan Ceramics.
14. Monarch Tile, Inc.
15. Porcelanite, Inc.
16. Quarry Tile Company.
17. Seneca Tiles, Inc.
18. Summitville Tiles, Inc.
19. United States Ceramic Tile Company.
20. Winburn Tile Manufacturing Company.

### B. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Finish: Bright, opaque glaze.
2. Face: Plain.

### C. Glazed Wall Tile: Flat tile as follows:

1. Module Size: 4-1/4 by 4-1/4 inches.
2. Thickness: 5/16 inch.
3. Face: Plain with modified square edges or cushion edges.
4. Finish: Bright, opaque glaze.
5. Mounting: Pregrouted sheets of tiles factory assembled and grouted with manufacturer's standard silicone rubber.

### D. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable.

1. Base: Coved Straight, module size 4-1/4 by 4-1/4 inches.
2. Wainscot Cap: Surface bullnose, module size 4-1/4 by 4-1/4 inches
3. External Corners: Surface bullnose.
4. Internal Corners: Field-buttet square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.

## 2.3 ACCESSORY MATERIALS

- A. Thresholds: Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.
- B. Waterproofing and Crack-Suppression Membranes for Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.
  - 1. Chlorinated-Polyethylene-Sheet Product: Non-plasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric, 0.030-inch nominal thickness.
    - a. Available Product: Noble Company (The); Nobleseal TS.
  - 2. PVC-Sheet Product: Two layers of PVC sheet heat-fused together and to facings of bondable nonwoven polyester, 0.040-inch nominal thickness.
    - a. Available Product: Compositite Corporation; Composeal Gold.
  - 3. Polyethylene-Sheet Product: Polyethylene faced on both sides with fleece webbing, 0.008-inch nominal thickness.
    - a. Available Product: Schluter Systems L.P.; KERDI.
  - 4. Corrugated-Polyethylene Product: Polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside, 3/16-inch nominal thickness.
    - a. Available Product: Schluter Systems L.P.; DITRA.
  - 5. Fabric-Reinforced, Modified-Bituminous Sheet Product: SBS-modified-bituminous sheet with woven reinforcement facing, 0.040-inch nominal thickness.
    - a. Available Product: National Applied Construction Products, Inc.; Strataflex.
  - 6. Fabric-Reinforced, Fluid-Applied Product: Liquid-latex rubber with fabric reinforcement.
    - a. Available Products:
      - 1) Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.
      - 2) LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
      - 3) MAPEI Corporation; PRP M19.
      - 4) Summitville Tiles, Inc.; S-9000.
  - 7. Unreinforced, Fluid-Applied Product: Liquid-latex rubber.
    - a. Available Products:

- 1) Boiardi Products Corporation; Elastiment 324 644.
  - 2) Custom Building Products; LevelQuick Waterproofing and Anti-Fracture Membrane.
  - 3) Jamo Inc.; Waterproof.
8. Latex-Portland Cement Product: Flexible mortar with acrylic-latex additive.
- a. Available Products:
    - 1) Boiardi Products Corporation; Elastiment 323.
    - 2) MAPEI Corporation; PRP 315.
    - 3) Southern Grouts & Mortars, Inc.; Southcrete 1100.
    - 4) TEC Specialty Products Inc.; TA-324, Triple Flex.
9. Urethane Waterproofing and Tile-Setting Adhesive: One-part liquid-applied urethane.
- a. Available Products:
    - 1) Bostik; Hydroment Ultra-Set.
    - 2) Southern Grouts & Mortars, Inc.; Deck-Seal 1000.
    - 3) <Insert manufacturer's name; product.>

## 2.4 SETTING AND GROUTING MATERIALS

- A. Available Manufacturers:
  1. Atlas Minerals & Chemicals, Inc.
  2. Boiardi Products Corporation.
  3. Bonsal, W. R., Company.
  4. Bostik.
  5. C-Cure.
  6. Custom Building Products.
  7. DAP, Inc.
  8. Jamo Inc.
  9. LATICRETE International Inc.
  10. MAPEI Corporation.
  11. Southern Grouts & Mortars, Inc.
  12. Summitville Tiles, Inc.
  13. TEC Specialty Products Inc.
- B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.
- C. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
  1. For wall applications, provide non-sagging mortar.
- D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Prepackaged dry-mortar mix containing dry additive to which only water must be added.
  2. Prepackaged dry-mortar mix combined with liquid-latex additive.
  3. For wall applications, provide non-sagging mortar.
- E. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
- F. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.
- G. Organic Adhesive: ANSI A136.1, Type I.
- H. Standard Sanded Cement Grout: ANSI A118.6, color as indicated.
- I. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.
- J. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.
1. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
  2. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.
- K. Grout for PregROUTED Tile Sheets: Same silicone rubber used in factory to pregrout tile sheets.

## 2.5 MISCELLANEOUS MATERIALS

- A. Elastomeric Sealants: Elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section 07920 "Joint Sealants."
1. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
    - a. Available Products:
      - 1) Bostik; Chem-Calk 550.
      - 2) Mameco International, Inc.; Vulkem 245.
      - 3) Pecora Corporation; NR-200 Urexpan.
      - 4) Tremco, Inc.; THC-900.
- B. Cementitious Backer Units: ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.
1. Thickness: Manufacturer's standard thickness, but not less than 1/4 inch.
  2. Available Products:
    - a. C-Cure; C-Cure Board 990.
    - b. Custom Building Products; Wonderboard.
    - c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    - d. USG Corporation; DUROCK Cement Board.
    - e. <Insert manufacturer's name; product.>

- C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.
- D. Metal Edge Strips: Angle or L-shape, stainless steel; ASTM A 666, 300 Series exposed-edge material.
- E. Grout Sealer: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
- C. Remove protrusions, bumps, and ridges by sanding or grinding.
- D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, pre-coat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

### 3.2 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and



center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.
  - 1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
- I. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11.
- J. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
  - 1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- K. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
  - 1. Exterior tile floors.
  - 2. Tile floors in wet areas.
  - 3. Tile floors composed of rib-backed tiles.
- L. Install tile on floors with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Quarry Tile: 1/4 inch.
  - 3. Paver Tile: 1/4 inch.
- M. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- N. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.
- O. Install tile on walls with the following joint widths:
  - 1. Glazed Wall Tile: 1/16 inch.
- P. Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

### 3.3 WALL TILE INSTALLATION SCHEDULE

- A. Interior wall installation over gypsum board on metal studs; organic adhesive; TCA W242.
  - 1. Grout: Polymer-modified sanded grout.
- B. Interior wall installation; thin-set mortar; over cementitious backer units; TCA W244.
  - 1. Thin-Set Mortar: Dry-set or Latex portland cement mortar.
  - 2. Grout: Polymer-modified sanded or Polymer-modified unsanded grout.
- C. Interior bathtub wall installation; cement mortar bed (thickset); over wood studs; TCA B411 metal studs; TCA B411 and TCA W241.
  - 1. Bond Coat: Dry-set Latex- portland cement mortar.
  - 2. Grout: Sand-portland cement Standard sanded cement Standard unsanded cement Polymer-modified sanded Polymer-modified unsanded grout.
- D. Interior wall and shower-receptor installation; cement mortar bed (thickset); over solid backing; TCA B414 and TCA W221 wood studs; TCA B414 and TCA W231 metal studs; TCA B414 and TCA W241.
  - 1. Bond Coat/Thin-Set Mortar: Dry-set or Latex portland cement mortar.
  - 2. Grout: Polymer-modified sanded or Polymer-modified unsanded grout.
- E. Interior wall and shower-receptor installation; thin-set mortar; over cementitious backer units; TCA B415 and TCA W244 TCA B420 and TCA W245
  - 1. Thin-Set Mortar: Dry-set or Latex portland cement mortar.
  - 2. Grout: Polymer-modified sanded or Polymer-modified unsanded grout.

**END OF SECTION**

## **SECTION 09960 COATINGS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes: Field applied coatings.
- B. Work Included in This Section:
  - 1. Coating of all surfaces provided in the Project, except as noted, including but not limited to:
    - a. Exposed, concealed, and submerged piping and conduits.
    - b. Exposed, concealed, and submerged structural steel and other metal surfaces.
    - c. Exposed, concealed and submerged concrete and concrete block surfaces.
    - d. Equipment delivered to Project Site without factory finished surfaces.
    - e. Surfaces of tanks and wet wells.
    - f. Walls, doors, woodwork, and architectural items.
    - g. Surfaces of existing items modified during performance of Work.
    - h. Miscellaneous items.
  - 2. In addition, coating of all:
    - a. Equipment, either new or existing, on which factory applied finishes have been marred, abraded, scratched, nicked, or otherwise damaged during Work.
    - b. Existing facilities and materials, whether within outside of the limits of work, on which existing finishes have been marred, abraded, scratched, nicked, or otherwise damaged during Work.
  - 3. In general, the following surfaces are not to be coated:
    - a. Concrete surfaces subject to pedestrian or vehicular traffic, except as herein specified.
    - b. Plastic surfaces, except as specified for identification purposes.
    - c. Nonferrous metals and stainless steel unless otherwise noted or indicated.
    - d. Existing coated surfaces which are not within areas of alterations performed for this Project unless such surfaces are damaged in performance of Work or unless otherwise specified herein.
    - e. Metal surfaces of anodized aluminum, chromium plate, copper, bronze, and similar finished materials except as may be so specified.

- f. Portions of metal embedded in concrete, except for aluminum surfaces.
  - g. Moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
  - h. Required labels or equipment identification, performance rating, name, or nomenclature plates.
- C. Related Work Not Included in this Section:
- 1. Coating of steel water storage tanks specified in Section 13414.
  - 2. Coating of mechanical equipment that is delivered to the project site with factory finish, as specified in the specific mechanical equipment sections,
  - 3. Coating of electrical equipment that is delivered to the project site with factory finish, as specified in Division 16 of these specifications.
  - 4. Coating of miscellaneous surfaces, as specified in other sections.

## 1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
- 1. D 4262-83 - Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
  - 2. D 4263-83 - Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
  - 3. D4285-83 - Test Method for Indicating Oil or Water in Compressed Air.
  - 4. D4541-93 - Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
- B. NACE International, The Corrosion Society (NACE):
- 1. RPO188-99 - Discontinuity (Holiday) Testing of Protective Coatings.
- C. National Association of Pipe Fabricators (NAPF):
- 1. NAPF 500-03 - Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.
- D. NSF International (NSF):
- 1. NSF 61 - Drinking Water System Components - Health Effects.
- E. SSPC – Society for Protective Coatings:
- 1. SSPC SP1 - Solvent Cleaning
  - 2. SSPC SP2 - Hand Tool Cleaning

3. SSPC SP3 - Power Tool Cleaning
  4. SSPC SP5 - White Metal Blast Cleaning
  5. SSPC SP6 - Commercial Blast Cleaning
  6. SSPC SP7 - Brush-Off Blast Cleaning
  7. SSPC SP10 - Near-White Blast Cleaning
  8. SSPC SP 11 - Power Tool Cleaning to Bare Metal
  9. SSPC-SP 12 - High- and Ultrahigh-Pressure Water Jetting
- F. Underwriters' Laboratory (UL):
1. UL 3P83 - Drinking Water System Components - Health Effects
- G. Unless otherwise specified, all work and materials for the preparation and coating of all metal surfaces shall conform to the applicable requirements specified in the Steel Structures Painting Manual, Volume-2, Systems and Specifications, latest edition, published by the Steel Structures Painting Council.

### 1.3 DEFINITIONS

- A. Submerged Metal: Ferrous surfaces below tops of channel or structure walls which will contain water even when above expected water level.
- B. Submerged Concrete and Masonry Surfaces: Concrete or masonry surfaces below tops of channel or structure walls which will contain water even when above expected water level.
- C. Exposed Surface: Any metal or concrete surface, indoors or outdoors that is exposed to view.
- D. Dry Film Thickness (DFT): Thickness of fully cured coating, measured in mils.
- E. Volatile Organic Compound (VOC): Content of air polluting hydrocarbons in uncured coating product measured in units of grams per liter or pounds per gallon, as determined by EPA Method 24.
- F. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.
- G. Coating Materials: Enamels, paints, sealers, epoxy resins, and all other paints and protective coatings, excepting galvanizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

### 1.4 PERFORMANCE REQUIREMENTS

- A. Coating materials for concrete and metal surfaces shall be especially adapted for use in water treatment plants.

- B. Coating materials used in conjunction with potable water supply systems shall be certified to NSF 61 or UL 3P83.
- C. Where SSPC surface preparation standards are specified or implied for ductile iron pipe or fittings, the equivalent NAPF surface preparation standard shall be substituted for the SSPC standard.
- D. Do not use coal tar epoxy in contact with drinking water.

#### 1.5 **SUBMITTALS**

- A. General: Submit in accordance with Section 01330.
- B. Samples: Contractor shall furnish one (1) square foot steel panel to be abrasive blasted in accordance with the abrasive blasting specifications and to be coated with a non-yellowing shellac, to be used as the standard for preparation of steel surfaces for the duration of Work.
- C. Product Data Sheets/Manufacturer's Instructions: Include the following:
  - 1. Special requirements for transportation and storage
  - 2. Mixing instructions
  - 3. Shelf life
  - 4. Pot life of material
  - 5. Precautions for applications free of defects
  - 6. Surface preparation
  - 7. Method of application
  - 8. Recommended number of coats
  - 9. Recommended dry film thickness (DFT) of each coat
  - 10. Recommended total dry film thickness (DFT)
  - 11. Drying time of each coat, including prime coat
  - 12. Required prime coat
  - 13. Compatible and non-compatible prime coats
  - 14. Recommended thinners, when recommended
  - 15. Limits of ambient conditions during and after application
  - 16. Time allowed between coats (minimum and maximum)
  - 17. Required protection from sun, wind and other conditions

18. Touch-up requirements and limitations
  19. Material Safety Data Sheet
  20. Maintenance cleaning directions
- D. Quality Assurance Submittals:
1. Quality Assurance plan
  2. Qualifications of coating applicator including list of similar projects
- E. VOC Compliance: Submit Notarized Certificate that:
1. All coating materials to be used on this project comply with the State of California Air Resources Board Rule 1113 VOC Regulations effective as of date of notice to proceed; and that
  2. All coating materials to be used on this project comply with the VOC regulations of the State of California Air Management District in which the coatings will be used, effective date of notice to proceed.
- F. Coating Materials List:
1. The Contractor shall provide six (6) copies of a coating materials list which indicates the manufacturer and product number, keyed to the Coating Schedule herein, for approval of the Owner prior to or at the time of submittal of samples required herein.
  2. The Contractor shall include with his submittal, his protective coating schedule for shop and field coatings of items to receive protection. Schedule shall conform to the specified requirements for surface preparation, priming, and coating for items covered, and shall follow the same requirements for similar work where such work has not been specifically called out. No bare ferrous nonworking surfaces shall be omitted from the schedule. Particular care shall be taken to cover in sufficient detail the coating of mechanical joints and other mechanical devices which shall conform to the recommended practice of the manufacturer of the joint or other mechanical devices.
  3. For all patching of existing surfaces, Contractor shall verify the type of existing coating on the surface whose new coatings are to be applied. Contractor shall include in his submittal documentation that new coatings to be applied are compatible with existing coatings.
  4. Submittal shall be sufficiently early to permit Owner's review and then Contractor's coordination with affected material and equipment suppliers to assure their use of approved shop coats of same manufacture as field coats and compatibility with field applied coats for respective coating systems.
  5. Coatings to be used on plastic and fiberglass materials shall be certified as acceptable by all plastic and fiberglass manufacturers whose products are to be coated. Certification copies shall be submitted to the Owner.

## 1.6 QUALITY ASSURANCE

- A. Applicator Qualifications:
  - 1. Minimum of 5 years experience applying specified type or types of coatings under conditions similar to those of the Work.
  - 2. Provide qualifications of applicator and references listing five similar projects completed in the past two years.
  - 3. Manufacturer approved applicator when manufacturer has approved applicator program.
  - 4. Applicator of off-site application of coal tar epoxy shall have successfully applied coal tar epoxy on similar surfaces in material, size, and complexity as on the Project.
- B. Compatibility of Coatings: Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.

## 1.7 SAFETY REQUIREMENTS

- A. In accordance with the requirements of the applicable OSHA Regulations for Construction, the Contractor shall provide and require the use of personal protective lifesaving equipment for all persons working in or about the project site.
- B. Respirators shall be worn by all persons engaged in, and assisting in, spray coating. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices meeting the requirements of ANSI Z87.1 latest revision, and approved OSHA Regulations for abrasive blasting operations and approved air-purifying, half-mask or mouthpiece respirator with appropriate filter. All blast line couplings shall be equipped with cable chokers and automatic shut off devices.
- C. Ventilation. Where ventilation is used to control potential exposure to workers as set forth in Section 1914.94 of the OSHA Regulations for Construction, ventilation shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation shall meet the requirements set forth in ANSI-Z9.2, latest revision.
- D. Sound Levels. In accordance with Sections 1926.52 and 1926.101 of OSHA Regulations for Construction, whenever the occupational noise exposure exceeds maximum sound levels as set forth in Table D-2 ear protective devices shall be fitted and determined individually and used, and a continuing, effective hearing conservation program shall be administered.
- E. Storage and mixing of coating materials shall be performed only in those areas designated by the Owner. All coatings and thinners shall be stored in a locked container with proper ventilation. All compressors shall be placed in secondary containment.
- F. Cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each work day.



- G. Take precautions to prevent fire and spontaneous combustion.

## 1.8 **PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. General: Deliver, store, and handle products in accordance with manufacturer's recommendation.

- B. Delivery:

1. Coating materials shall be delivered to project site in original unopened containers with seals unbroken and labels intact. Designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer shall be plainly legible at the time of use.
2. Pigmented coating materials shall be furnished in containers not larger than five (5) gallons.
3. Containers shall not be opened until inspected by the Owner.
4. No coating material shall be over 12 month from manufacturing date when delivered to project site.
5. Remove unspecified and unapproved coating materials from project site immediately.
6. Deliver abrasive grit in original moisture-proof bags or airtight bulk containers.

- C. Storage:

1. Store materials in a single, approved location.
2. Store coatings in well-ventilated facility that provides protection from the sun weather, and fire hazards. Maintain ambient storage temperature between 45 and 90 degrees Fahrenheit, unless otherwise recommended by the manufacturer.

- D. Handling:

1. Coating containers shall be opened only when required for use. Coatings shall be mixed only in designated rooms or spaces in the presence of the Owner's Representative. Coating shall be thoroughly strained, stirred, boxed or agitated utilizing air powered or electric drills to uniformly smooth consistency and prepared and handled in a manner to prevent deterioration and inclusion of foreign matter. Unless otherwise specified or approved, no materials shall be reduced, changed, or used except in accordance with the manufacturer's label or data sheet.
2. Materials of different manufacturers shall not be mixed together.
3. Packaged materials may be thinned immediately prior to application in accordance with the manufacturer's directions.
4. Only mixing of full kits will be allowed, No splitting of kits.

## 1.9 PROJECT CONDITIONS

- A. Surface Moisture Contents: Do not coat surfaces that exceed manufacturer specified moisture contents, or when not specified by the manufacturer, the following moisture contents:
  - 1. Plaster and Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete and Concrete Block: 12 percent.
  - 3. Interior Located Wood: 15 percent.
  - 4. Concrete Floors: 7 percent.
- B. Do Not Apply Coatings:
  - 1. Under dusty conditions, unless tenting, covers, or other such protection is provided for structures to be coated.
  - 2. When light on surfaces measures less than 15 foot-candles.
  - 3. When ambient or surface temperature is less than 50 degrees Fahrenheit unless manufacturer allows a lower temperature.
  - 4. When relative humidity is higher than 85 percent.
  - 5. When surface temperature is less than 5 degrees Fahrenheit above dew point.
  - 6. When surface temperature exceeds the manufacturer's recommendation.
  - 7. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
  - 8. Apply clear finishes at minimum 65 degrees Fahrenheit.
- C. Provide fans, heating devices, dehumidifiers, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 50 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes.

## 1.10 GUARANTEE

- A. A three (3) year guarantee which commences on the date of acceptance against failure of all coatings shall be provided. Failure of any coating during the guarantee period shall be repaired by the Contractor who shall absorb all costs related to the repair of the coating, including inspection.

### 1.11 PROTECTION OF WORK

- A. The Contractor shall be responsible for any and all damage to his work or the work of others during the time his work is in progress, including any overspray claims.

### 1.12 EXTRA STOCK

- A. The Contractor shall deliver to the Owner a minimum of one (1) one (1) gallon cans of each type and color of finish material used on the project and one (1) one (1) gallon cans of each primer. Each container shall be unopened and properly labeled for identification.

### 1.13 RIGHT OF REJECTION

- A. The Owner shall have the right to reject all material or work that is unsatisfactory, and require the replacement of either or both at the expense of the Contractor.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Products shall be standard for recognized manufacturer engaged in production of such materials for essentially identical or similar applications in the water and wastewater treatment industry and industrial plants.
- B. Compatibility: Only compatible materials shall be used in the Work. Particular attention shall be directed to compatibility of primer and finish coats. If necessary, subject to approval of the Owner, a compatible barrier coat shall be applied between all existing prime coat and subsequent field coats to insure compatibility.

### 2.2 Coating Materials:

- A. Colors: All colors and shades of colors of all coats of coating materials shall be as selected by the Owner. Each coat shall be of a slightly different shade, as directed by the Owner to facilitate inspection of surface coverage of each coat.
- B. Whenever a manufacturer's brand name is specified, it is intended to define the general type and quality of coating desired. Other coatings of equal quality may be used. Coating materials shall be a product of:
  - 1. Ameron
  - 2. Carboline
  - 3. Porter International
  - 4. Rust-Oleum
  - 5. Tnemec
  - 6. or equal
- C. All coating materials shall be produced and applied as herein called for or, if not specifically called for, shall be applied in accordance with the manufacturer's printed recommendations as approved by Owner.

- D. So far as possible, all coating materials shall be provided by a single source supplier.
- E. Coat project materials and surfaces according to the Coatings Schedule at the end of this section. For items not called out in the schedule, coat according to the table below. Coating Schedule and Table are intended for general use and are not intended to call out every surface. Contractor shall coat all surfaces included in the project, as specified herein, whether or not listed.

	Submerged	Corrosive Atmosphere	Normal Atmosphere Interior	Normal Atmosphere Exterior (incl. Salt)	Buried	Submerged-Potable Water	Exterior-Clear Sealant	Interior-Varnish
Ferrous Metal	A	C	B	B	J	K		
Ferrous Metal, Galv.		L	B	B				
Non-Ferrous		D						
Concrete	F	F	H	G	J		Q	
Masonry			H	G			Q	
Plastic		L	L					
FRP			I	I				
Wood			M	M				P
Gypsum			N					
Moving Parts					E			
Stainless Steel								

**2.3 SERVICE CONDITION A**

- A. Type of Coating: Polyamidoamine epoxy.
- B. Typical Surface Application: Ferrous metals, submerged in water, sludge, or similar corrosive liquids.
- C. Surface Preparation: All metal surfaces shall be field sandblasted in accordance with Steel Structures Painting Council Specification SSPC-SP10 (Near White Blast

Cleaning). Weld surface, edges, and sharp corners shall be ground to a curve and all weld splatter removed.

- D. Application: Application shall be in strict conformance with the manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush only-applied coat of the specified coating prior to application of each coat.
- E. Coatings and Dry Film Thickness (DFT): Except as otherwise noted, the prime coat shall have a minimum thickness of 4 mils and the two finish coats shall have a minimum total dry film thickness of 12 mils and a maximum of 20.0 mils. If finish coat is not applied within manufacturer's recommended time period, the coating shall be sweep blasted or abraded to remove all gloss.

Carboline System:	Primer – 890 Carboguard	4.0 to 5.0 mil
	Intermediate – 890 Carboguard	4.0 to 5.0 mil
	Finish Coats – 890 Carboguard	4.0 to 5.0 mil
Devoe System:	Primer – 236 Bar-Rust	4.0 to 5.0 mil
	Intermediate – 236 Bar-Rust	4.0 to 5.0 mil
	Finish Coats – 236 Bar-Rust	4.0 to 5.0 mil
Tnemec System:	Primer – 69-1255HB	4.0 to 5.0 mil
	Intermediate – 69-1255HB	4.0 to 5.0 mil
	Finish Coats – 69-1255HB	4.0 to 5.0 mil

**2.4 SERVICE CONDITION B-1**

- A. Type of Coating: Polyamidoamine epoxy, aliphatic acrylic polyurethane.
- B. Typical Surface Application: Ferrous metals, normal air exposure.
- C. Surface Preparation: All surfaces shall be free of dirt, dust, grease, or other foreign matter before coating. Ferrous surfaces shall be cleaned in accordance with the Steel Structures Painting Council specification SSPC-SP10 (Near White Blast Cleaning), and galvanized surfaces shall be cleaned in accordance with SSPC-SP1 (Solvent Cleaning). Weld surfaces and rough edges shall be ground as required to make the piece neat and for proper application of coating, and weld splatter shall be removed. Prepare substrate surfaces in accordance with these Specifications and the printed instructions and recommendations of the manufacturer of each product applied.
- D. Application: Application shall be in strict conformance with tile manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- E. Coatings and Dry Film Thickness (DFT): Prepare all surfaces to receive coatings in accordance with these Specifications and the printed instructions and recommendations of the protective coating manufacturer for each product applied.

Carboline System: Interior Exposure - Ferrous Metals

	Primer - 890 Carboguard	4.0 to 6.0 mil
	Finish - 890 Carboguard	4.0 to 6.0 mil
	Exterior Exposure - Ferrous Metals	
	Primer 890 Carboguard	4.0 to 6.0 mil
	Finish - Carbothane134 H.S.	3.0 to 4.0 mil
Devoe System:	Interior Exposure - Ferrous Metals	
	Primer – 236 Bar-Rust	4.0 to 6.0 mil
	Finish – 236 Bar-Rust	4.0 to 6.0 mil
	Exterior Exposure – Ferrous Metals	
	Primer – 236 Bar-Rust	4.0 to 6.0 mil
	Finish – 379H Devthane	3.0 to 4.0 mil
Tnemec System:	Interior Exposure- Ferrous Metals	
	Prime Coat - 69-1255HB	4.0 to 6.0 mil
	Finish Coat - 69-1255 HB	4.0 to 6.0 mil
	Exterior Exposure- Ferrous Metals	
	Prime Coat - 69-1255HB	4.0 to 6.0 mil
	Finish Coat – 1075	3.0 to 4.0 mil

**2.5 SERVICE CONDITION B-2**

- A. Type of Coating: Polyamidoamine epoxy, aliphatic acrylic polyurethane
- B. Typical Surface Application: Galvanized ferrous metals, normal air exposure.
- C. Surface Preparation: All surfaces shall be free of dirt, dust, grease, or other foreign matter before coating. Galvanized surfaces shall be cleaned in accordance with SSPC-SP1 (Solvent Cleaning). Prepare substrate surfaces in accordance with these Specifications and the printed instructions and recommendations of the manufacturer of each product applied.
- D. Application: Application shall be in strict conformance with tile manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- E. Coatings and Dry Film Thickness: Degrease, and abrade all surfaces, then apply the following coating system.

Carboline System:	Interior Exposure - Zinc Alloy or Galvanized Metal	
	Pretreat Coat-Rustbond Sealer	1.0 to 2.0 mil
	Primer Coat – 890 (Galvanized)	4.0 to 6.0 mil
	Finish Coat – 890 Carbogard	4.0 to 6.0 mil

	Exterior Exposure - Zinc Alloy or Galvanized Metal	
	Pretreat Coat-Rustbond Sealer	1.0 to 2.0 mil
	Primer Coat – 890 (Galvanized)	4.0 to 6.0 mil
	Finish Coat – 134 Carbothane	3.0 to 4.0 mil
Devoe System:	Interior Exposure - Zinc Alloy or Galvanized Metal	
	Primer Coat – 203WB (Galvanized)	3.0 to 4.0 mil
	Finish Coat – 236 Bar-Rust	4.0 to 6.0 mil
	Exterior Exposure – Zinc Alloy or Galvanized Metal	
	Primer Coat – 203WB Devran	4.0 to 6.0 mil
	Finish Coat – 379 Devthane	3.0 to 4.0 mil
Tnemec System:	Interior Exposure	
	Primer Coat – Series 69-1255 HB	4.0 to 6.0 mil
	Finish Coat – Series 69-HB	4.0 to 6.0 mil
	Exterior Exposure- Ferrous Metals	
	Primer Coat – Series 69-1255HB	4.0 to 6.0 mil
	Finish Coat – Series 1075	3.0 to 6.0 mil

## 2.6 SERVICE CONDITION C

- A. Type of Coating: Polyamidoamine epoxy, aliphatic acrylic polyurethane
- B. Typical Surface Application: Ferrous metals, other than stainless steel, within wet wells and similar locations subject to a corrosive atmosphere and condensation.
- C. Surface Preparation: All metal surfaces shall be abrasive blasted in accordance with Steel Structures Painting Council Specification SSPC-SP5 (White Metal Blast Cleaning). Weld surface, edges and sharp corners shall be ground to a radius and all weld splatter removed.
- D. Application: Application shall be in strict conformance with the manufacturer's printed recommendations. A minimum of 12 hours time is required before additional coats may be applied to the prime coat. Application shall be in strict conformance with tile manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- E. Coatings and Dry Film Thickness: Except as hereinafter specified, the prime coat shall have a minimum dry film thickness of 5 mils; the intermediate coat, 5 mils; and the final coat, 5 mils. The total system shall have a minimum dry film thickness of 15 mils.

Carboline System:	Interior Exposure - Zinc Alloy or Galvanized Metal	
	Pretreat Coat-Rustbond Sealer	1.0 to 2.0 mil
	Primer Coat – 890 (Galvanized)	4.0 to 6.0 mil

	Finish Coat – 890 Carbogard	4.0 to 6.0 mil
	Exterior Exposure - Zinc Alloy or Galvanized Metal	
	Pretreat Coat-Rustbond Sealer	1.0 to 2.0 mil
	Primer Coat – 890 (Galvanized)	4.0 to 6.0 mil
	Finish Coat – 134 Carbothane	3.0 to 4.0 mil
Devoe System:	Interior Exposure - Zinc Alloy or Galvanized Metal	
	Primer Coat – 203WB (Galvanized)	3.0 to 4.0 mil
	Finish Coat – 236 Bar-Rust	4.0 to 6.0 mil
	Exterior Exposure – Zinc Alloy or Galvanized Metal	
	Primer Coat – 203WB Devran	4.0 to 6.0 mil
	Finish Coat – 379 Devthane	3.0 to 4.0 mil
Tnemec System:	Interior Exposure	
	Primer Coat – Series 69-1255 HB	4.0 to 6.0 mil
	Finish Coat – Series 69-HB	4.0 to 6.0 mil
	Exterior Exposure- Ferrous Metals	
	Primer Coat – Series 69-1255HB	4.0 to 6.0 mil
	Finish Coat – Series 1075	3.0 to 6.0 mil

## 2.7 SERVICE CONDITION D

- A. Type of Coating: Polyamidoamine epoxy.
- B. Aluminum and non-ferrous metal surfaces, including undersides of access hatches and frames, subject to corrosive atmosphere and condensation.
- C. Surface Preparation: Clean non-ferrous surfaces in accordance with SSPC-SP1 (Solvent Cleaning). Abrade surface to achieve 1.0 mil profile, or as specified by the coating manufacture.
- D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
- E. Coatings and Dry Film Thickness: Conform with the following to provide minimum total dry mil thickness of 10.0 mils:

Carboline System:	Pretreatment –Rustbond Sealer	1.0 to 2.0 mil
	Intermediate- Carboguard 890	3.0 to 4.0 mil
	Finish Coat – Carboguard 890	3.0 to 4.0 mil
Devoe System:	Primer – 203WB Primer	3.0 to 4.0 mil
	Intermediate- 236 Bar-Rust	3.0 to 4.0 mil
	Finish Coat – 236 Bar-Rust	3.0 to 4.0 mil



Tnemec System:	Primer – 69 Series	3.0 to 4.0 mil
	Finish Coat – 69 Series	3.0 to 4.0 mil

**2.8 SERVICE CONDITION E**

- A. Type of Coating: Grease.
- B. Typical Application Surfaces: Submerged moving parts including cables, chains, gears, pulleys, etc.
- C. Surface Preparation: All rust, scale, dust, and foreign mater removed by power or hand tool cleaning, as per SSPC/SP#2.
- D. Application: Application shall be in strict accordance with manufacturer's recommendations.
- E. Coatings and Thickness: system shall have a total thickness of 25 mil and shall consist of the following:

Chevron - E. P. Roller Grease  
 Texaco - Rust Inhibitive Grease

**2.9 SERVICE CONDITION F**

Where designated in the coating schedule, concrete which is subject to submergence and intermittent submergence in water, sludge and chemical mixtures, or which is exposed to corrosive atmospheres shall be prepared and coated in accordance with the following requirements.

- A. Surface Preparation: All surfaces shall be cleaned of all dirt, dust, form oil, curing compounds, and other deleterious compounds. Abrasive blast to open all bug holes and provide a profile equal 40 to 80 grit sandpaper. Contractor shall perform plastic sheet test (ASTM D-4263) 24 hours prior to application of coatings. All concrete surfaces shall be vacuumed prior to application of coating system. All surfaces shall be completely dry before application of the coating. A key way shall be saw cut at all termination points.
- B. Application: Application shall be in strict conformance with the manufacturer's printed recommendations. All coats shall be applied within 24 hours of the previous coat. No drum band heaters shall be used. A ratio check and weight check when utilizing expanded material shall be preformed in the presence of the Owner's Representative prior to the start of any lining applications. Hardness check will be preformed at the end of each coating application shift.
- C. Coating System F: (EXHIBITS TIGHT CEMENT AND EXPOSED AGGREGATE THAT IS ONE INCH OR LESS) The total system shall be 150.0 mils minimum, 100.0 mils being expanded and the 50.0 mils being solid. (EXHIBITS TIGHT CEMENT AND EXPOSED AGGREGATE THAT IS ONE INCH OR MORE) The system shall be 250 mils minimum, 200 mils being expanded and 50 being solid.
- D. Voids, bug holes, tie holes, or cracks in the concrete should be filled using standard "Concrete Institute" approved methods. Resurfacing procedures that are acceptable

shall include back rolling a 10 – 15 mils base coat of the specified lining material or a 2:1 ECOSYSTEM expansion of a 20 mils solid film of the same material. For severely deteriorated concrete surfaces containing exposed aggregate with a severe peak-to-valley profile, ENDURA-TUF 2000 may be applied – Reference the ENDURA-TUF 2000 Guide Specification, Direct-to Concrete for details. Other resurfacing methods shall be acceptable such as sacking with an approved cementitious grout, or use of a filled epoxy system. If an epoxy system is employed it shall be 100 percent volume solids. For sub grade cracks it is recommended that a suitable moisture resistant caulk such as Sika-Flex 1-A be used.

- E. Fins and sharp offsets, protrusions, or similar irregularities projecting from the concrete surface shall be removed back to the surface by chipping, brush hammering, needle gunning, or other mechanical means. Sharp offsets in the surface, such as those caused by form work misalignments, should be mechanically abraded to provide gradual and smooth transitions between the offset surfaces.
- F. Expansion joints shall be sealed with a bond breaker tape (polyethylene-backed adhesive tape acceptable). Prior to installation of the bond breaker tape, round-off sharp edges, remove debris/dust, and inspect to assure that joint compound is reasonably flush with top edge of expansion joint. Apply a tack coat of EF-1988 material to adjacent areas, followed immediately with installation of the tape. Tape shall be installed centered over the joint and be of sufficient width to extend a minimum of one inch onto the concrete on both sides of the joint. Tape thickness should be no more than 50 percent of the specified coating thickness. Bond breaker tape shall be top coated with EF-1988 to the minimum specified thickness.
- G. Leading edges: A mechanical anchor for the leading edge of the applied material shall be installed. This leading edge mechanical anchor shall consist of a saw cut to a minimum depth of ¼ inch and width of 1/8 inch. Sharp edges of the saw cut shall be rounded, dried, and cleaned of debris. After cleaning, the EF-1988 solid base coat shall be applied into the saw cut, taking care to penetrate to full depth (the use of a trowel or putty knife might be required). After installation of the leading edge, the area shall be top coated with EF-1988 composite material. Adjacent areas not scheduled for coating shall be taped off and protected from over-spray.
- H. Water seeping or flowing into or through the concrete must be stopped by epoxy injection before the system is applied.
- I. Concrete Surface Cleanliness: Sprinkle water on the dried suspect concrete surface. If the water spreads out immediately instead of standing as droplets, it may be concluded that the surface is not contaminated by oils or dust. If droplets are found, use the procedure stated in paragraph A.
- J. Chemical Cleaning: site shall be maintained free of debris, water, oil, grease, silicones, wax, pitch, and other types of oily substances. Surfaces showing evidence of such contaminants shall be cleaned using solutions of trisodium phosphate, and or steam cleaning with a bio degradable degreaser. They should be applied with vigorous scrubbing, followed by flushing with fresh clean water to remove all traces of both the detergent and contaminant.
- K. Approved Products/System F:

1. Contractor Qualifications: The contractor shall submit qualifications and certification that they are licensed to apply the proposed polyurethane product per patent # 4,590,218 for expanded polyurethane films.
2. Manufacturer's Representative Site Visits: The manufacturer's representative shall visit the job site for the purposes of assisting the Owner's Representative and or Owner's Representative in the verification of surface preparation and applied liner as to consistency with manufacturer's recommendations.
3. Application Equipment: The application equipment shall be able to heat and proportion the polyurethane material per the manufacturer's requirements. Band heaters shall not be used.
4. Product: The product shall be an ASTM Type V elastomeric polyurethane that is proportioned in a 2A:1B ratio. Proposed product shall contain no silica or other fillers or extenders. Proposed product shall have no more than 65% and no less than 40% elongation. Product shall exhibit tensile strength of 2800 psi to 3000 psi.
5. Approved Manufacturer: Prepared manufacturer is Global Echo Technologies of Pittsburgh, CA Endura-Flex EF-1988 or pre-approved equal. Proposed equal products shall be considered so long as they are submitted and pre approved a minimum of 15 days prior to bid date.
6. The System: The system shall consist of type v elastomeric polyurethane applied in expanded form per patent #4,590,218 for expanded polyurethane films at an expansion rate of 2:1. Expanded base shall have a solid film cap. Expansion technologies that depend on chemical reaction with the polyurethane to expand or that are open cell in nature shall not be used.
7. Application: The liner shall be applied one coat to a total film thickness of 200 mils of which a minimum of 50 mils is solid.

**2.10 SERVICE CONDITION G**

- A. Type of Coating: Water borne cementitious acrylic, acrylic emulsion.
- B. Typical Application Surfaces: Poured in place concrete or concrete block subject to normal or salt air exterior exposure.
- C. Surface Preparation: All surfaces shall be free of dirt, dust, grease or other foreign matter and by dry before coating. Water blast at 3,500 P.S.I. minimum.
- D. Application: Application shall be in strict conformance with the manufacturer's printed recommendations as approved by the Owner.
- E. Coatings and Dry Film Thickness: Conform with the following to provide a minimum dry film thickness of 12.0 mils.

		<u>Dry Film Mils</u>
Carboline System:	Prime Coat – Sanitile 100	10.0 – 12.0
	Finish Coat – Sanitile 155	<u>3.0 – 4.0</u>

	Total Dry Film Mils	12.0 – 16.0
Devoe System:	Prime Coat- 4000 Bloxfil	10.0 – 12.0
	Finish Coat- 2200 Dulux	4.0 – 5.0
	Total Dry Film Mils	14.0 – 17.0
Tnemec System:	Block Filler-Series 130-6602 Environfill	8.0 – 10.0
	2 Finish Coat- Series W180 Tneme-Crete	4.0 – 5.0
	Total Dry Film Mils	14.0 – 20.0

## 2.11 SERVICE CONDITION H-1

- A. Type of Coating: Polyamidoamine epoxy.
- B. Poured in place concrete subject to normal interior exposure.
- C. Surface Preparation: Water blast at 3,000 P.S. I. Minimum. All surfaces shall be free of dirt, dust, grease and other foreign matter and be dry before coating.
- D. Application: Application shall be in strict conformance with the manufacturer's printed recommendations as approved by the Owner.
- E. Coatings and Dry Film Thickness: Conform with the following to provide a minimum total dry mil thickness of 9.0 mils.

		<u>Dry Film Mils</u>
Carboline System:	Prime Coat – Sanitile 100	10.0 – 12.0
	Finish Coat – Sanitile 155	2.0 – 3.0
	Total Dry Film Mils	12.0 – 15.0
Devoe System:	Prime Coat-167 Pre-prime	1.0 – 1.5
	Finish Coat-236 Bar-Rust	8.0 – 10.0
	Total Dry Film Mils	9.0 – 11.5
Tnemec System:	Prime Coat - Series 69 (Color) H.B.	4.0 – 6.0
	Epoxoline II	
	Finish Coat- Series 69 (Color) H.B.	5.0 – 7.0
	Epoxoline II	
	Total Dry Film Mils	9.0 – 13.0

## 2.12 SERVICE CONDITION H-2

- A. Type of Coating: Water borne cementitious acrylic, polyamidoamine epoxy.
- B. Concrete block subject to normal interior exposure.
- C. Surface Preparation: Water blast at 3,000 P.S. I. Minimum. All surfaces shall be free of dirt, dust, grease and other foreign matter and be dry before coating.

- D. Application: Application shall be in strict conformance with the manufacturer's printed recommendations as approved by the Owner.
- E. Coatings and Dry Film Thickness: Conform with the following to provide a minimum total dry mil thickness, of 8.0 mils plus block filler:

		<u>Dry Film Mils</u>
Carboline System:	Prime Coat - Flexxide masonry block filter @ (75 s q./ft./gal)	10.0 – 12.0
	Finish Coat – Sanaitile 555	3.0 – 4.0
	Total Dry Film Mils	<hr/> 13.0 – 16.0
Devoe System:	Prime Coat – 4000 Blox-fill @ rate of 75 sq. ft./gal.	
	Intermediate Coat - 236 Bar-Rust	4.0 – 6.0
	Finish Coat - 236 Bar-Rust	4.0 – 6.0
	Total Dry Film Mils	<hr/> 8.0 – 12.0
Tnemec System:	Prime Coat - Series 130-6602 @ rate of (75 s q./ft./gal)	
	Intermediate Coat – Series 69	4.0 – 6.0
	Finish Coat- Series 69	4.0 – 6.0
	Total Dry Film Mils	<hr/> 8.0 – 12.0

**2.13 SERVICE CONDITION I**

- A. Type of Coating: Polyamidoamine epoxy, aliphatic acrylic polyurethane.
- B. Typical Application Surfaces: Coating for plastic and fiberglass reinforced plastic (FRP) pipe for purposes of color coding and label stenciling. Coatings to be used for this category shall be certified by the pipe manufacturer to be completely acceptable and non-injurious to the pipe.
- C. Surface Preparation. Lightly abrade pipe and wipe with a solvent to degrease and clean surface.
- D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
- E. Coatings and Dry Film Thickness: Two (2) coats @ 3.0 mils each having a total dry film thickness of 6.0 mils.

Carboline System:	Prime Coat – Rustbond Sealer
	Finish Coat – 134 H.3WB “Carbothane”
Devoe System:	Primer – 201 Devran
	Finish – 379H Devthane

Tnemec System:           Primer – Series 69 H.B. Epoxoline II  
 Finish – Series #1075 Endura Shield

**2.14 SERVICE CONDITION J**

- A. Type of Coating: Coal Tar Solution.
- B. Typical Application Surface: Buried ferrous metals and concrete.
- C. Surface Preparation: Ferrous Metals: SSPC-SP-7.  
Concrete: Acid etch or light abrasive blast.
- D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
- E. Coatings and Dry Film Thickness (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Tnemec Series</u>	<u>Devoe Series</u>
2	15	46-450	247

**2.15 SERVICE CONDITION K**

- A. Type of Coating: Epoxy.
- B. Typical Application Surface: Non-galvanized ferrous metals, submerged or subject to submergence in potable water.
- C. Surface Preparation: Ferrous Metals: SSPC-SP-10.
- D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
- E. Coatings and Dry Film Thickness (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Tnemec Series</u>	<u>Devoe Series</u>
1	3.0	20HB-1255	233
2	10.0	20HB-AA90	233

**2.16 SERVICE CONDITION L**

- A. Type of Coating: Epoxy or epoxy urethane, color required.
- B. Typical Application Surfaces: Interior non-submerged metals, plastic piping, concrete, mild or severe chemical or corrosion exposure.
- C. Surface Preparation:           Ferrous Metals: SSPC-SP-6,  
Plastic Piping: SSPC-SP-1,  
Galvanized and Nonferrous Metals: SSPC-SP-1,  
Concrete: Acid etch or abrasive blast.

D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.

E. Coatings and Dry Film Thickness (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Tnemec Series</u>	<u>Devoe Series</u>
2	10 (metals and concrete) 6.0 (plastics)	69	Same as System D

**2.17 SERVICE CONDITION M**

A. Type of Coating: Modified acrylate.

B. Typical Application Surfaces: Interior or exterior wood.

C. Surface Preparation: As specified elsewhere in this Section.

D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.

E. Coatings and Dry Film Thickness (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Tnemec Series</u>	<u>Devoe Series</u>
1	1.5	151	1102
1	4.0	156	462

**2.18 SERVICE CONDITION N**

A. Type of Coating: Epoxy.

B. Typical Application Surfaces: Gypsum drywall, pipe insulation.

C. Surface Preparation: Clean and dry.

D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.

E. Coatings and Dry Film Thickness (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Tnemec Series</u>	<u>Devoe Series</u>
1	1.0	51-792	55201
2	6.0	113	669

**2.19 SERVICE CONDITION O**

A. Type of Coating: Aliphatic polyurethane.

- B. Typical Application Surfaces: Overhead rolling doors (both sides).
- C. Surface Preparation: SSPC-SP-1.
- D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
- E. Coatings and Dry Film Thickness (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Tnemec Series</u>	<u>Devoe Series</u>
1	4.0	135	233
1	2.0	75	379

**2.20 SERVICE CONDITION P**

- A. Type of Coating: Polyurethane varnish.
- B. Typical Application Surfaces: Interior wood, including shelving, benches, cabinets, doors and elsewhere that a clear finish is indicated.
- C. Surface Preparation: Sanding.
- D. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
- E. Coatings: Two coats Sherwin Williams Rextane heavy duty polyurethane varnish. Sand between coats.

**2.21 SERVICE CONDITION Q**

- A. Type of Coating: Clear penetrating sealer.
- B. Typical Application Surfaces: Exterior concrete block and concrete.
- C. Surface Preparation:
  1. New concrete block and concrete to cure for a minimum of thirty days before being coated.
  2. Moisture content to be no higher than 15 percent as registered on an electronic moisture meter.
  3. All cracks, other than hairline cracks to be tuck-pointed or caulked. All voids and bee holes in masonry units shall be filled. Defective mortar joints shall be routed out and pointed with mortar, or caulked and tooled.
  4. Remove any soil, mud, efflorescence, excessive mortar, etc. Use "dry" cleaning method, if possible. If wet cleaning is required, allow adequate time in drying.
  5. Sealer shall be applied under factory supervision, and shall be warranted to perform for five years.



D. Application: Coating shall be flood coated on properly prepared vertical surfaces. Application rate shall be as recommended by the manufacturer for the surface receiving the coating.

E. Coatings and Dry Film Thicknesses (DFT):

<u>Minimum No. of Coats</u>	<u>Total DFT</u>	<u>Manufacturer</u>
1	N/A	Rainguard STD-E with Micro-Lok; Professional; Prosoco, or equal

**2.22 MISCELLANEOUS COATINGS:**

A. Repair of Galvanized Coatings:

1. Type of Coating: Patch Coat for Galvanized Surfaces.
2. Typical Application Surface: Field applied touch-up of galvanized surfaces.
3. Surface Preparation: As recommended by manufacturer.
4. Application: Apply per manufacturer’s recommendation prior to application of other coatings required for designated service condition.
5. Coatings:
  - a. “Carbo Zinc 11” by Carboline,
  - b. "Drygalv" by American Solder and Flux Co,
  - c. or equal.

B. Primer Over Bituminous Coating:

1. Type of Coating: Polyamidoamine Epoxy.
2. Typical Application Surface: Prime surfaces previously coated with bituminuous coatings prior to applying coatings as specified.
3. Surface Preparation: As recommended per manufacturer.
4. Application: Application shall be in strict conformance with manufacturer's printed recommendations.
5. Coatings: 2 coats, Bar-Rust 236, Tnemec 69-1211, or equal.

**2.23 HEAT RESISTANT COATINGS**

A. To insure proper coating selections, accurately measure surface temperatures. Surface preparation shall be performed in strict conformance with manufacturer's printed directions and treated surfaces shall be coated as soon as possible to avoid surface contamination. Mix and apply coats of each system in conformance with printed directions of manufacturer as it concerns curing before recoating or before run-in to surface operating temperature. Contingent upon expected temperature range apply one of the following or equal systems, and avoid excessive film build.

Carboline System:        To 200°F 890 Epoxy  
                                       To 400°F Thermaline 4900 VOC

To 450°F Thermaline 4900 VOC

Devoe System: To 200°F 236 Epoxy  
To 400°F 403 HT VOC  
To 450° 304 Catha Coat

## 2.24 REWORK OF PROTECTIVE COATINGS WITHIN ALTERED EXISTING PROCESS FACILITIES

Perform specified surface preparation, mixing and application operations on respective altered existing surfaces. Use like materials by manufacturers as those used in coating respective new surfaces.

- A. Submerged and Intermittent Submerged Existing Ferrous Metals. Perform work as specified for Service Condition "A" in Paragraph 2.3.
- B. Ferrous Metals Subject to Normal Air Exposure at Project Location or Similar Chemical Attack. Perform work as specified for Service Condition "B" in Paragraph 2.04.
- C. Ferrous Metals Subject to Corrosive Atmosphere and Condensation. Perform work as specified for Service Conditions "C" in Paragraph 2.6.
- D. Non-Ferrous Metal Surfaces Subject to Condensation and Corrosive Atmospheres. Perform work as specified for Service Condition "D" in Paragraph 2.7.
- E. Existing and Altered Moving Parts Such as Cables, Chains, Gears, Pulleys, etc. Perform work as specified for Service Condition "E" in Paragraph 2.8.
- F. Existing and Altered Concrete Surfaces Subject to Submergence and Intermittent Submergence. Perform work as specified for Service Condition "F" in Paragraph 2.9.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. All surface preparation, coating shall conform to applicable standards of the National Association of Corrosion Engineers, the Steel Structures Painting Council, the American Concrete Institute, the Forest Products Research Society and the Manufacturer's printed instructions. Coating materials applied prior to approval of surface by the Owner's Representative shall be removed and reapplied to the satisfaction of the Owner's Representative at the expense of the Contractor.
- B. Manufacturer's Recommendations: Coating materials manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, minimum and maximum recoat windows; sweat in times; protection of his coating materials; for preparation of surfaces for coating; and for all other procedures relative to coating shall be strictly observed. Use only manufactures thinners. No substitutions or other deviations will be permitted without written permission of the Owner.

- C. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice.
- D. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish shall be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.
- E. Where prime coatings are shop applied, instruct suppliers to provide the prime coat compatible with the finish coat specified. Any off-site work which does not conform to the specification is subject to rejection by the Owner's Representative.

Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Owner's Representative. Use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire-brushing, hand or power tool cleaning or dry air blast cleaning. In order to prevent injury to surrounding coated areas blast cleaning may require use of lower air pressure, smaller nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If damage is too extensive or uneconomical to touch-up, the item shall be recleaned and coated as directed by the Owner's Representative.

- F. The coating and painting equipment shall be designed for application of materials and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Equipment shall be subject to approval by the Owner's Representative.
- G. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight hour working day. Any cleaned areas not receiving first coat within eight-hour period shall be recleaned prior to application of first coat.
- H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating system specified.

### 3.2 **SURFACE PREPARATION**

#### A. General:

1. All surfaces to receive protective coatings shall be cleaned as specified herein prior to application of coating materials. Contractor shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. Beginning the work of this Section without reporting unsuitable conditions to the Owner constitutes acceptance of conditions by the Contractor. Any required removal, repair, or replacement of this work caused by unsuitable conditions shall be done at no additional cost to the Owner. All marred or abraded spots on shop-primed and factory-finished surfaces shall receive touch-up restoration prior to any other coating application.
2. Items Not to be Coated: Hardware, hardware accessories, name plate data tags, machined surfaces and similar items in contact with coated surfaces not to be coated shall be removed or masked prior to surface preparation and coating operations. Following completion of coating of each piece, removed items shall be reinstalled.

Such removal and installation shall be done by workmen skilled in the trades involved.

B. Abrasive Blasting:

1. All abrasive blasting shall be done in strict accordance with the referenced specifications of the Steel Structures Painting Council and shall conform to all regulations of the local and California (CARB) Air Pollution Control Agency.
2. When items are to be shop primed or shop primed and finish coated in the shop, surface preparation shall be as specified in this Section. Owner shall have the right to witness, inspect, and reject any Abrasive blasting done in the shop. If automatic blast units are used the working mixture of abrasive shall be 75% grit and 25% shot.
3. Abrasive blasting shall be done outside the treatment plant. Contractor shall provide suitable protection from inclement weather while Abrasive blasting is in progress to ensure that all required standards for surface preparation are met. Should unforeseen difficulties develop in performing abrasive blasting outside the plant, Owner may allow temporary relocation of materials and equipment to designated areas inside the plant to maintain progress. Such permission shall be granted entirely at Owners discretion, must be in writing, and shall not relieve Contractor's responsibility for maintaining required standards of quality and progress on the work. When abrasive blasting is done inside the plant, care shall be taken to prevent damage to structures and equipment. The work area shall be enclosed by tarps and or dust collectors and, in addition, pumps, motors, and other equipment shall be shielded, covered, or otherwise protected to prevent the entrance of abrasive or dust. Contractor shall be responsible for all over-spray and dust claims and any related damage. All blast equipment shall be equipped with oil/water separators and dryers. Air stream testing shall be preformed daily in accordance with ASTM D 4285.
4. No Abrasive blasting may begin before the Owner inspects and approves the protective measures. The Contractor shall be responsible for all damage caused by or resulting from Abrasive blasting in all cases. Contractor shall be responsible for disposal of all blast residue in accordance with applicable Federal, Owner and Local regulations.
5. After abrasive blasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. Contractor shall be responsible for all cost for disposal of all blast residue in accordance with applicable Federal, State and Local regulations.
6. Dispose of all wastes from abrasive blasting, and any other wastes generated during the Work. Sample and test wastes as required by regulatory agencies, and as necessary for classification of wastes prior to disposal. This work includes all costs for waste sampling, testing, accumulation, transport, and disposal, including the cost for wastes classified as hazardous and non-hazardous.
7. Do not abrasive blast when air temperature is less than 5 degrees F above dew point.

C. Surface Preparation, Metallic Surfaces:

1. Surface preparation will be based on comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC-Vis 1, ASTM Designation D220: "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces", SSPC-Vis 2, ASTM Designation D610;"Visual Standard for Surfaces of New Steel Air-blast Cleaned with Sand Abrasive", NACE Standard TM-01-70; and as described below. Anchor profile for prepared surfaces shall be measured by use of a non-destructive instrument such as a Keane-Tator Surface Profile Comparator or Testex Press-O-Film System.
2. Heavy deposits of grease or oil shall be removed with solvent oil cleaner and any chemical contamination shall be neutralized and/or flushed off prior to any other surface preparation.
3. Particle size of abrasives used in blast cleaning shall be that which will produce a 2 mil (50.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating system to be applied.
4. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating and shall not be reused unless specifically approved by the Owner's Representative.
5. During blast cleaning operations, caution shall be exercised to insure that existing coatings are not exposed to abrasion from blast cleaning.
6. Keep the area of work in a clean condition and do not permit blasting materials to accumulate as to constitute a nuisance or hazard to performance of work or operation of existing facilities.
7. Blast cleaned surfaces shall be cleaned prior to application of specified coatings by a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the Owner's Representative.
8. All welds shall be cleaned with a suitable chemical compatible with the specified coating materials.
9. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.3 through 2.23 of these specifications.
10. Application SSPC specifications are as follows:
  - a. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
  - b. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding, and wire-brushing.
  - c. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by power wire-brushing, power impact tools or power sanders.

- d. White Metal Blast Cleaning (SSPC-SP5): Blast cleaning to a gray-white uniform metallic color until each element of surface is free of all visible residues.
- e. Commercial Blast Cleaning (SSPC-SP6): Blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
- f. Brush-off Blast Cleaning (SSPC-SP7): Blast cleaning to remove loose rust, loose mill scale and other detrimental foreign matter to degree specified.
- g. Near White Blast cleaning (SSPC-SP10): Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.

D. Surface Preparation, Concrete and Masonry to be Coated:

- 1. This section specifies surface preparation for all concrete and masonry that will be coated.
- 2. Concrete and masonry shall cure at least 28 days and have a moisture content prior to coating below 8 percent as measured by an instrument such as a Delmhorst Model DP, unless recommended otherwise by the coating material manufacturer.
- 3. All surfaces shall be thoroughly cleaned by abrasive blasting (ASTM D4259), wire-brushing acid etching (ASTM D4260), or other approved methods, removing all traces of foreign materials. Remove all loose concrete and masonry by chipping or other approved methods to leave only a sound, firmly bonded substrate. Cracks and voids shall be repaired or filled as directed by the Owner's Representative with approved suitable materials, mixed and applied in strict accordance with the Manufacturer's printed instructions. In general, final surface shall be smooth and free of voids, cavities, dirt, dust, oils, grease, or other contaminants.
- 4. Where oil or grease deposits are present, prior to above surface preparation, clean surfaces by scrubbing with a solution of one and one-half ounces (44.4 ml) tri-sodium phosphate (TSP) and one and one-half ounces (44.4 ml) of non-sudsing detergent mixed into one gallon (3.785 liters) of warm water. Surfaces shall then be flushed clean with fresh water.
- 5. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.3 through 2.23 of these specifications.

E. Surface Preparation, Concrete and Masonry to be Sealed:

- 1. This section specifies surface preparation for all concrete and masonry that will be sealed.
- 2. Concrete and masonry shall cure at least 28 days and have a moisture content prior to coating or coating below 8 percent as measured by an instrument such as a Delmhorst Model DP, unless recommended otherwise by the coating materials manufacturer.
- 3. All surfaces shall be thoroughly cleaned by abrasive blasting (ASTM D4259), wire-brushing acid etching (ASTM D4260), or other approved methods, removing all traces of foreign materials. Remove all loose concrete and masonry by chipping or

other approved methods to leave only a sound, firmly bonded substrate. Cracks and voids shall be repaired or filled as directed by the Owner's Representative with approved suitable materials, mixed and applied in strict accordance with the Manufacturer's printed instructions. In general, final surface shall be smooth and free of voids, cavities, dirt, dust, oils, grease, or other contaminants.

4. Where oil or grease deposits are present, prior to above surface preparation, clean surfaces by scrubbing with a solution of one and one-half ounces (44.4 ml) tri-sodium phosphate (TSP) and one and one-half ounces (44.4 ml) of non-sudsing detergent mixed into one gallon (3.785 liters) of warm water. Surfaces shall then be flushed clean with fresh water.
5. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in Part 2.3 through 2.23 of these specifications.

F. Surface Preparation, Wood and Composition Materials:

1. Wood and composite materials shall have a moisture content prior to coating below 15 percent.
2. All surfaces shall be thoroughly cleaned by use of mineral spirits, scrapers, sandpaper, or wire brushes to remove all dirt, oil, grease or other foreign substances. Finished surfaces exposed to view shall, if necessary, be made smooth by planing or sandpapering. Small, dry, seasoned knots shall be scraped, sandpapered, and thoroughly cleaned, and shall be given a thin coat of WP-578 Western Pine Association knot sealer before application of the priming coat. Large, open unseasoned knots, and all beads or streaks of pitch shall be scraped off, or if the pitch is still soft, it shall be removed with mineral spirits and the resinous area shall be thinly coated with knot sealer. After priming, all holes and imperfections shall be filled with putty or plastic wood (colored to match the finish wood), allowed to dry, and sandpapered smooth. Coating of interior wood and composite materials shall proceed insofar as practicable, only after masonry work has dried. Existing surfaces shall be cleaned of all loose or flaking paint and sandpapered as required.
3. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.05 of these specifications.

G. Mechanical and Electrical Equipment:

1. Remove grilles, covers and access panels for mechanical and electrical system from location and coat separately.
2. Finish coat primed equipment with color selected by the Owner's Representative.
3. Prime and coat insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with prefinished coating.
4. Replace identification markings on mechanical or electrical equipment when coated over or spattered.

5. Coat interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
  6. Coat dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
  7. Coat exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
  8. Coat both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
  9. Color code equipment, piping, conduit and exposed ductwork and apply color banding and identification, such as flow arrows, naming and numbering, in accordance with Divisions 15 and 16.
- H. Surface Preparation, Previously Coated Surfaces: Repair surface defects. Remove grease, oil and other contaminants as specified for steel surfaces. Scrape carefully to remove deteriorated coatings. Glossy or very hard coatings shall be sanded lightly to promote maximum adhesion of the subsequent coating. Surface must be thoroughly dry before coating.
- I. Special Requirements for Galvanized and Non-Ferrous Metals: Where galvanized or non-ferrous metals are scheduled to be coated, the surface shall be coated before application of the prime coat with a passivator or vinyl acid wash compound in accordance with the recommendations of the manufacturer of the prime and finish coatings to be used. Thickness of this coating and the zinc galvanizing (if present) shall not be included within the total system thickness as specified in this section.

### 3.3 APPLICATION OF COATINGS

- A. All protective coating materials shall be applied in strict accordance with the manufacturer's printed instructions.
- B. Except where in conflict with the manufacturer's printed instructions, or where other wise specified herein, the Contractor may use brush, roller, air spray, or airless spray application; however, any spray application of coating materials must first have the approval of the Owner. Rollers for applying enamel shall have a short nap. Areas inaccessible to spray coating or rolling shall be coated by brushing or other suitable means.
- C. Prime coat shall be applied to cleaned surfaces within a four hour period of the cleaning, and prior to deterioration or oxidation of the surface and in accordance with the manufacturer's recommendations.
- D. All surfaces to be coated shall be clean and dry at the time of application.
- E. Drift from Abrasive blasting procedures shall not be allowed to settle on freshly coated surfaces, work area shall be clear of all visible dust.



- F. All coatings shall be applied in dry and dust-free environment. Do not apply coatings when air temperature is less than 5 degrees F above dew point. No coating shall be applied when the surrounding air temperature, measured in the shade, is below 50 degrees F.
- G. The Contractor shall provide a heated environment to obtain temperature and humidity conditions if necessary to meet schedule requirements at no additional cost to the Owner.
- H. No coating shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 55 degrees F. within eight hours after the application of the coating. Dew or moisture condensation should be anticipated and if such conditions are prevalent, coating shall be delayed until mid-morning to be certain that the surfaces are dry. Day's coating shall be completed well in advance of the probable time of day when condensation will occur, in order to permit the film a sufficient drying time prior to the formation of moisture or reaching the dew point.
- I. All coatings shall be applied in a workmanlike manner so as to produce an even film of specified uniform thickness. Finished surfaces shall be free from runs; drops; drips; ridges; waves; laps; brush marks; pin holes; variations in color, texture, and finish; and other evidence of poor workmanship. Hiding shall be so complete that the addition of another coat would not increase the hiding.
- J. Edges, corners, crevices, welds, and joints shall receive special attention to insure that they have been thoroughly cleaned and that they receive a film thickness equivalent to adjacent areas.
- K. Protective coverings shall be used to prevent lapping coating materials on floors, fixtures, glass, hardware, and equipment. Care shall be exercised to prevent coating materials from being spattered onto surfaces from which such materials cannot be removed satisfactorily. Surfaces from which coating materials cannot be removed satisfactorily shall be coated or recoated as required to produce a finish satisfactory to the Owner.
- L. Coatings shall be sharply cut to lines.
- M. Whenever two (2) coats of a dark, colored coating, are specified, the first coat shall lighter color to act as an indicator of proper coverage, or the two (2) coatings shall be of a contrasting color.
- N. Holiday test 100% per NACE RPO-188 all coatings in immersion and vapor areas, until no holidays are detected.
- O. Time of Coating: Manufacturer's recoat time shall be strictly complied with. Sufficient time shall be allowed to elapse between successive coats to permit satisfactory recoating, but, once commenced, the entire coating operation shall be completed without delay. No additional coating of any structure, equipment, or other item designated to be coated shall be undertaken without specific permission of the Owner until the previous coating has been completed for the entire structure, piece of equipment, or other item.

- P. Piping shall not be finish coated until it has been pressure tested and approved.
- Q. Thickness of Coating: dry film mil-thickness specified shall be achieved and verified for each coat, before applying next coat.
- R. Touch-up of all surfaces shall be performed after installation.
- S. Shop Coating: Fabricated metalwork and equipment which requires coating may be shop primed with specified primer, the field top coat will be from the same manufacture. Any such work delivered to the job site with any other shop coat shall have this coating removed and the specified coating applied in the field. Contractor shall be fully aware of all maximum re-coat times. Manufactured equipment with approved corrosion resistant factory finishes and galvanized finishes shall be exempt from this requirement of stripping. No red primers shall be allowed.

### 3.4 TESTING AND INSPECTION

- A. Inspection Devices: Contractor shall furnish, until final acceptance of coating, inspection devices in good working condition for evaluation of abrasive blasting, testing of air supply, monitoring environmental conditions, detection of holidays, and measurement of dry-film thickness of coatings.
  - 1. Four (4) rolls of Testex tape 1.5 to 2.5 mils X-course prior to the start of abrasive blasting.
  - 2. Nondestructive magnetic type dry-film thickness gage such as the Positech 6000, and U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of dry-film thickness gauge and certified instrumentation to test accuracy.
  - 3. Low voltage holiday detector of the wet-sponge type, such as Model M1 as manufactured by Tinker and Razor, with non-sudsing type wetting agent, such as Kodak Photo-Flo, which shall be added to the water prior to wetting the sponge.
  - 4. High voltage, low current, spark type detector such as, manufactured by D.E. Sterns. 14/20, with three 14" wire brush wands.
  - 5. For testing coatings over non-ferrous surfaces, a Tooke Gauge.
  - 6. Device for holiday testing tape type coatings.
  - 7. Portable temperature/humidity recorders to provide continuous permanent hard copy of the Project site environmental conditions.
- B. Access to Site: When requested by the Owner's Representative for inspection of coated surfaces, provide:
  - 1. Adequate lighting, without shadows, during all phases of work to insure that work is performed as specified. Illuminate entire area of work.
  - 2. Ground supported scaffolding and lighting, as determined by the Owner's Representative, to facilitate visual and instrument inspection by the Owner's Representative of each phase of the work and of the completed work. Place as directed to minimize glare and shadows.

3. Personnel to move scaffolding and furnish other assistance to the Owner or Owner's Representative as required.
- C. Verify at a minimum of two times daily that air supply is free of oil and moisture contamination. Effective oil and water separators shall be used in all main compressor-airlines and shall be placed as close as practicable to the equipment. Prior to using compressed air, quality of air downstream of the separators shall be tested at suitable outlets by blowing the air on clean white blotter for 2 minutes to check for any contamination, oil, or moisture.
  - D. Measure air temperature, humidity, relative humidity, and metal surface temperature, and determine dew point and relative humidity prior to abrasive blasting or coating each day. Repeat measurements and determination of dew point as often as the Owner's Representative deems necessary but not less often than every four hours. Maintain a written record of measurements and dew points, and time that measurements were taken. Make record available to Owner's Representative immediately on request.
  - E. Owner's Representative will examine surfaces after blast cleaning to verify that all deposits of contaminants have been removed. Contractor shall blow down, or vacuum all surfaces prior to inspection.
  - F. Owner's Representative will evaluate surface preparation using field abrasive blasting standards, and Testex tape. Evaluation will include inspection of blasted surfaces for dust and abrasive residue, using clear adhesive coated tape. Evaluation will be made immediately prior to coating application.
  - G. Verify cleanliness of all spray application equipment prior to, or no later than, time of mixing coating material.
  - H. Measure wet film thickness during coating application of coating to ensure adequate coating thickness. Take at least one measurement every 100 square feet.
  - I. Measure dry film thickness after each coat using a non-destructive magnetic dry film thickness gauges.
    1. Measure in accordance with SSPC-PA 2 except: Delete paragraph 3.1.1 through 3.1.3 and replace with: "for each 1,000 square feet area, three 100 square feet areas shall be randomly selected and measured."
    2. Owner's Representative may also measure coating thickness, at random locations, after each coat.
  - J. Owner's Representative will evaluate cleanliness of coated surface immediately prior to application of a subsequent coat.
  - K. The Owner's Representative and Contractor shall conduct film thickness measurements and electrical holiday inspection of the coated surfaces with equipment furnished by Contractor. Contractor shall recoat and repair as necessary for compliance with the Specifications.
    1. After coated ferrous metals areas have cured, final inspection tests will be conducted by the Contractor, in the presence of the Owner's Representative. All pinholes shall

be marked, repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted. Coatings not in compliance with the Specifications will not be acceptable and shall be replaced and reinspected at Contractor's expense until the Specifications are met.

2. After coated non-ferrous surfaces have cured, final inspection tests shall be conducted by the Contractor, in the presence of the Owner's Representative. Dry film thickness readings shall be taken at random locations with a Tooke Gauge at the rate of approximately five readings per 100 square feet of surface. Grooves cut into coating shall be repaired by application of all coats of coating film being tested. Average of all readings for a given area or surface shall be within required dry film thickness range and no individual reading shall be more than .1 percent below the recommended dry film thickness. Any areas that are found to be below standard shall be marked and recoated to obtain proper film thickness.

- L. Warranty Inspection: Warranty inspection shall be conducted during the warranty period following completion of all coating work. All personnel present at the Pre-Job Conference shall attend this inspection. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Owner's Representative.

### 3.5 **CLEANUP**

- A. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint/Coating spots, oil, or stains upon adjacent surfaces shall be removed.
- B. The Contractor shall clean the site in accordance with the requirements for "Cleaning Up" in the "General Conditions."

### 3.6 **COLOR CODING AND IDENTIFICATION**

- A. All galvanized steel and ductile iron piping and plastic pipe systems which are visible within the interior and exterior of the treatment plant shall be color coded; colors to be selected by plant Park staff.
- B. In addition to other specified coating in the Coating Schedule for piping, a legend showing the name of the contents and an arrow showing the direction of flow shall be stenciled on each pipe of the systems listed in the Piping Identification Schedule, using the colors listed. Legends shall be located at 20 foot maximum intervals, and in general, at each valve and piece of equipment. Intermediate locations may be stenciled with abbreviations instead of the full name of the material in the pipe. The size and location of the legend shall be in general accordance with ANSI A13.1-1975.
- C. Snap on markers by Seton (Setmark) or approved equal may be used for pipe identification and flow direction.
- D. Pumps and other items of equipment to be coated shall be coated the color corresponding to their service in accordance with this schedule.
- E. Where groups of pipes pass through walls, make turns, or otherwise are to be identified, locate all color bands and striping, arrows and legend neatly in line. Color stripes two

inches wide. Lettering shall be done only in black or white, of size no less than 1 inch high, applied over the main color. Directional arrows shall be black, about 4 inches long, located at bends, equipment, and every 20 feet of straight runs.

### 3.7 **COATING SCHEDULE**

- A. General: The following Coating System Schedule shall indicate the coating system to be used. List shall not be construed as a complete list of all surfaces to be coated but rather as a guide as to the application of the various coating systems. All Contractor installed surfaces shall be coated except those specifically deleted herein. Owner shall select the colors. Where reference is made to ferrous metal in this schedule, it shall not include stainless steel.

**END OF SECTION**

**SECTION 10200  
LOUVERS AND VENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes **fixed, formed-metal louvers**.
- B. See Division 8 Section 08110 - **Steel Doors and Frames** for louvers in doors.
- C. See Division 15 Sections for louvers that are a part of mechanical equipment.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Air-Performance, Water-Penetration, and Wind-Driven Rain Ratings: As demonstrated by testing manufacturer's stock units according to AMCA 500-L.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
  - 1. Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. 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. Louvers:
    - a. Airline Products Co.
    - b. Airolite Company (The).
    - c. American Warming and Ventilating, Inc.
    - d. Arrow United Industries.
    - e. Carnes Company, Inc.
    - f. Cesco Products.
    - g. CopperCraft
    - h. Construction Specialties, Inc.
    - i. Dowco Products Group; Safe-Air of Illinois, Inc.
    - j. Greenheck.

- k. Industrial Louvers, Inc.
- l. Louvers & Dampers, Inc.
- m. Metal Form Manufacturing Company, Inc.
- n. Mid American building Products, Inc
- o. NCA Manufacturing, Inc.
- p. Nystrom Building Products.
- q. Reliable Products; Hart & Cooley, Inc.
- r. Ruskin Company; Tomkins PLC.
- s. Vent Products Company, Inc.

## 2.2 MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 zinc coating, mill phosphatized.
- B. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.3 FABRICATION, GENERAL

- A. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- B. Join frame members to each other and to louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view.

## 2.4 FIXED, FORMED-METAL LOUVERS

- A. Horizontal, Non-Drainable-Blade Louver:
  - 1. Frame and Blade Material and Nominal Thickness: Galvanized steel sheet, not less than **0.052 inch for frames and 0.040 inch for blades**.
  - 2. Performance Requirements:
    - a. Air Performance: Not more than **0.15-inch wg** static pressure drop at **900-fpm** free-area velocity.

## 2.5 LOUVER SCREENS

- A. General: Provide screen at interior face of each exterior louver.
- B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.
- C. Louver Screening:
  - 1. Bird Screening: Galvanized steel, 1/2-inch- square mesh, 0.041-inch wire.

## 2.6 WALL VENTS (BRICK VENTS)

- A. Extruded-Aluminum Wall Vents: Extruded-aluminum louvers and frames, not less than 0.125-inch nominal thickness, assembled by welding; with 18-by-14- mesh, aluminum

insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.

## **2.7 FINISHES**

- A. Aluminum, Anodic Finish: **Class I, clear anodic coating complying with AAMA 611.**
- B. Galvanized Steel Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- E. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

**END OF SECTION**



## **SECTION 10431 SIGNS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Panel Signs
  - 2. Signage accessories.

#### **1.2 SUBMITTALS**

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
  - 1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 2. Provide message list for each sign, including large-scale details of wording, lettering.

#### **1.3 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where 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. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

#### **2.2 PANEL SIGNS**

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 5005-H15 or 3004-H15.
  - 1. All cutting, punching of holes, leveling, and straightening of the blanks shall be performed prior to degreasing and etching operations.

2. Aluminum shall be free of corrosion, white rust, and dirt, and shall be degreased by either of the following methods:
    - a. Vapor degreasing. Blank shall be completely immersed in a saturated vapor of trichloroethylene or perchlorethylene. All trademark printing shall be removed using either lacquer thinner or controlled alkaline cleaner, then entire blank rinsed thoroughly with running water, or Alkaline degreasing. Blank shall be immersed completely in a tank containing alkaline solution controlled and titrated to the specification of the solution manufacturer. Immersion time shall depend of the amount of dirt for removal. After immersion, the blanks shall be thoroughly rinsed with running water.
    - b. Blanks shall require etching by either: Acid etch, using a six percent to eight percent (6% to 8%) phosphoric acid solution @ 100 degrees F (38C). After blank is well etched it shall be thoroughly rinsed with running water, then rinsed additionally through a hot water tank or Alkaline etched. Process shall well etch pre-cleaned blanks in an alkaline solution controlled by titration.
  3. Fabrication to a finished sign blank, including a hole pattern, shall be done in such manner as to assure that finished blanks shall be free of buckle, crevice, warp, dent, cockles, burrs, and/or other irregularities. Finished blanks shall have an allowable variation from the plane of no more than .04" (.016cm) per lineal foot of blank surface.
  4. All sign blank corners shall be radiused.
  5. Thickness: 0.080 inches
- C. Retroreflective Film: Type 1 Engineering Grade retroreflective film with 7 year minimum warranty, 3M, Nikkalite, or approved equal.
- D. Mounting Hardware:
1. Post Mounting: Mount with minimum 2, galvanized 3/8" bolts with nuts and washers on 2" diameter galvanized metal post as shown. All hardware galvanized.
  2. Wall Mounting: Attach to wall with minimum 4 galvanized 1/4" x 1-1/2" lag screws. Position sign and holes within sign so that screws screw into studs. If this is not possible, use lag bolts as approved by Owner's Representative.
  3. Fence Mounting: Attach to fence with galvanized hardware, with 1/8" x 1" galvanized backing plate, length as required, two backing plates per sign installed horizontally at top and bottom of sign. Attach with minimum 4 galvanized 3/8" bolts with nuts and washers.
- E. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule as shown on Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance

### 3.2 SIGN SCHEDULE:

Mark	Size (H x W)	Text*	Colors	Mounting Style
No Parking 1	18 x 12	No Parking	Red on White	Post Bottom 6.5' above FG.
No Parking 2	18 x 12	No Parking (2") Fire Lane (2")	Red on White	Post Bottom 6.5' above FG.
Slow	18 x 12	Speed (2") Limit (2") 5	Black on White	Post, Bottom 4.0' above FG
Do Not Enter	18 x 12	Do (2") Not (2") Enter (2")	Black on White	Post, Bottom 2.0' above FG
ADA 1	12 x 12	(Handicap Symbol)	White on Blue	Post, Bottom 7.0' above FG
ADA 2	6 x 12	Van Accessible	White on Blue	Post (below ADA 1 on same post)
ADA 3	12 X 12	This Route (2") No ADA (2")	White on Blue	Post, Bottom 3.0' above FG
Emergency 1	12 X 12	Emergency (1.8") Access (1.8") Route (1.8") (Text "Highway B")	White on Red	Post, Bottom 6.5' above FG
Emergency 2	12 X 12	End (3") Emergency (1.8") Access (1.8") Route (1.8") (Text "Highway B")	White on Red	Post, Bottom 6.5' above FG
Office	6 x 12	Store (1.5") Office (1.5")	Black on White	Wall, bottom of sign 6.0' above FG.
Recycling	6 x 12	Recycling Center	Black on White	Fence, bottom of sign 5.5' above FG.
WTB	6 x 12	Water Treatment (1.5") Building (1.5")	Black on White	Post, Bottom 6.0' above FG

\* Text is 3", font "Highway C" unless noted otherwise.

**END OF SECTION**

**SECTION 10520  
FIRE-PROTECTION SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes portable fire extinguishers.

**1.2 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
  - 1. Fire Extinguishers: Include rating and classification.

**1.3 QUALITY ASSURANCE**

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

**2.2 PORTABLE FIRE EXTINGUISHERS**

- 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. Amerex Corporation.
  - 2. Ansul Incorporated.
  - 3. Badger; Div. of Figgie Fire Protection Systems.
  - 4. Buckeye Fire Equipment Company.
  - 5. Fire-End & Croker Corporation.
  - 6. General Fire Extinguisher Corporation.
  - 7. J. L. Industries, Inc.
  - 8. Kidde, Walter The Fire Extinguisher Co.
  - 9. Larsen's Manufacturing Company.
  - 10. Modern Metal Products; Div. of Technico.
  - 11. Moon/American, Inc.
  - 12. Pem All; Div. of Pem Systems, Inc.
  - 13. Potter-Roemer; Div. of Smith Industries, Inc.
  - 14. Samson Products, Inc.

15. Watrous; Div. of American Specialties, Inc.
  16. Schedule: Provide fire extinguishers according to the following schedule.
    - a. One fire extinguisher at each activity structure (2 total), mount to post near cooking area.
    - b. One fire extinguisher at the amphitheater, mount on projection screen support post.
    - c. One fire extinguisher in the office building, mount on interior wall near side door.
    - d. One fire extinguisher in the water treatment plant, mount on exterior wall near door.
    - e. One fire extinguisher at the camp host site, mount on ramada support post.
  17. Mounting Brackets: Mount each fire extinguisher with Manufacturer's standard steel, designed to secure extinguisher indicated and with plated or baked-enamel finish.
  18. Identification: Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface above each fire extinguisher. When mounted on posts, provide vertical lettering.. Lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Owner's Representative.
- C. Multipurpose Dry-Chemical Type: UL-rated 2-A:10:B:C, 5-lb nominal capacity, in enameled-steel container.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

**END OF SECTION**

**SECTION 10801  
TOILET AND BATH ACCESSORIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Toilet and bath accessories.
  - 2. All accessories shall be manufactured and installed to conform to ADA requirements.

**1.2 SUBMITTALS**

- A. Product Data: For each product indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Basis-of-Design Products: The design for toilet and bath accessories described in Part 2 are based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - 1. Toilet and Bath Accessories:
    - a. A & J Washroom Accessories, Inc.
    - b. American Specialties, Inc.
    - c. Bobrick Washroom Equipment, Inc.
    - d. Bradley Corporation.
    - e. General Accessory Manufacturing Co. (GAMCO).
    - f. McKinney/Parker Washroom Accessories Corp.
  - 2. Infant-Care Products:
    - a. American Infant Care Products Inc.
    - b. American Specialties, Inc.
    - c. Brocar Products, Inc.
    - d. General Accessory Manufacturing Co. (GAMCO).
    - e. Koala Corporation.
    - f. Safe-Strap Company, Inc.

**2.2 MATERIALS**

- A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch minimum nominal thickness, unless otherwise indicated.

- B. Brass: ASTM B 19, ASTM B 16, or ASTM B 30 castings.
- C. Steel Sheet: ASTM A 366/A 366M, 0.0359-inch minimum nominal thickness.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
- J. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## 2.3 TOILET AND BATH ACCESSORIES

- A. Paper Towel Dispenser:
  1. Type: As directed by the Owner's Representative to match Owner's standard supply.
  2. Material: Stainless steel.
  3. Lockset: Tumbler type.
  4. Refill Indicators: Pierced slots at sides or front.
  5. Provide in each bathroom stall near sink.
- B. Toilet Tissue Dispenser:
  1. Type: Double-roll dispenser with cover hinged secured with vandal-resistant lockset.
  2. Mounting: Surface mounted with concealed anchorage.
  3. Material: Stainless steel.
  4. Provide in each bathroom stall near toilet.
  5. Capacity: Designed for 4-1/2-inch diameter-core tissue rolls.
- C. Waste Receptacle:
  1. Type: Open top, recessed Surface mounted.
  2. Capacity: 12 Gallon.
  3. Liner: Reusable vinyl liner.
  4. Provide in each bathroom stall near sink.
- D. Liquid-Soap Dispenser:
  1. Mounting: Surface.
  2. Capacity: 40 ounces.
  3. Materials: Stainless steel body with PVC insert.

4. Stainless-Steel Soap Valve: Designed for dispensing soap in liquid form.
  5. Lockset: Tumbler type.
  6. Refill Indicator: Window type.
  7. Provide one dispenser in each bathroom stall over sink and one dispenser over outdoor sink.
- E. Grab Bar:
1. Material: Stainless steel, 0.05 inch thick.
  2. Mounting: Exposed.
  3. Gripping Surfaces: Slip-resistant texture.
  4. Outside Diameter: 1-1/2 inches for heavy-duty applications.
  5. Provide as shown on Drawings.
- F. Sanitary Napkin Disposal Unit:
1. Mounting: Surface.
  2. Material: Stainless steel.
  3. Door or Cover: Self-closing.
  4. Receptacle: Removable and reusable.
  5. Provide one unit in each bathroom stall.
- G. Seat-Cover Dispenser:
1. Mounting: Surface.
  2. Capacity: 250 covers.
  3. Material: Stainless steel.
  4. Lockset: Tumbler type.
  5. Provide one unit in each bathroom stall.
- H. Mirror Unit:
1. Frame: fixed tilt.
  2. Provide one unit in each bathroom stall over sink.
- I. Folding Shower Seat:
1. Basis-of-Design Product: Bobrick Model B-5191
  2. Configuration: Rectangular seat .
  3. Frame constructed of type-304, satin-finish stainless steel, 16-gauge 1-1/4" square tubing, and 18-gauge, 1" diameter seamless tubing.
  4. Rectangular seat shall be constructed of one-piece, 5/16" (8mm) thick, water-resistant, ivory-colored solid phenolic with black edge.
  5. Seat support shall not come into contact with floor. Seat shall be attached to wall by two 3" diameter mounting flanges constructed of type 304, 3/16" thick stainless steel with satin finish.
  6. Shower seat shall comply with barrier-free accessibility guidelines (including ADAAG in the (U. S. A.)). Seat shall be able to lock in upright position when not in use.
  7. Sufficient strength to support a single user up to a maximum static load of 450 lbs (204 kg).
  8. Provide two units in each shower stall, one in shower and one in changing area as shown on Drawings.
- J. Soap Dish:



1. Mounting: Surface mounted, with rectangular wall bracket and backplate for concealed mounting
  2. Construction: Stainless Steel.
  3. Provide one dish in each shower stall.
  4. Mount to conform to ADA requirements.
- K. Robe Hook:
1. Double-Prong Unit: Stainless-steel, double-prong robe hook with rectangular wall bracket and backplate for concealed mounting.
  2. Provide two units in each shower stall. Mount one unit on inside of door. Mount one unit in changing area at a height to conform to ADA requirements.
- L. Diaper-Changing Station:
1. Horizontal, Surface-Mounted Unit: Diaper-changing station with surface-mounted, mildew-resistant, molded polyethylene body that folds horizontally against wall when not in use; projects not more than 4 inches from wall when closed; and is engineered to support a minimum of 250-lb static weight when opened. Provide unit with pneumatic shock-absorbing operating mechanism and built-in dispenser for sanitary liners.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
1. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

**END OF SECTION**

**SECTION 11000  
EQUIPMENT GENERAL PROVISIONS**

**PART 1 - GENERAL**

**1.1 THE REQUIREMENT**

- A. The Contractor shall provide all tools, supplies, materials, equipment, and all labor necessary for furnishing, construction, installation, testing, and operation of all equipment and appurtenant work, complete and operable, all in accordance with requirements of Contract Documents.
- B. The provisions of this Section shall apply to all equipment specified and where referred to, except where otherwise specified or shown.

**1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

- A. Commercial Standards. All equipment, products, and their installation shall be in accordance with the following standards, as applicable, and as specified in each Section of these specifications:
  - 1. American Society for Testing and Materials (ASTM).
  - 2. American Public Health Association (APHA).
  - 3. American National Standards Institute (ANSI)
  - 4. American Society of Mechanical Engineers (ASME).
  - 5. American Water Works Association (AWWA).
  - 6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
  - 7. American Welding Society (AWS).
  - 8. National Fire Protection Association (NFPA).
  - 9. Federal Specifications (FS).
  - 10. National Electrical Manufacturers Association (NEMA).
  - 11. Manufacturer's published recommendations and specifications.
  - 12. General Industry Safety Orders (OSHA).
- B. The following standards have been referred to in this Section of specifications:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25,125,250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy, and Other Special Alloys
ANSI B46.1	Surface Texture
ANSI S12.6	Method for Measurement of Real-Ear Attenuation of Hearing Protectors
ANSI/ASME .20.1	General Purpose Pipe Threads (Inch)
Annals/ASME B31.1	Power Piping
Annals/AWWA D100	Welded Steel Tanks for Water Storage
AWWA C206	Field Welding of Steel Water Pipe
ASTM A 48	Specification for Gray Iron Castings
ASTM A 108	Specification for Steel Bars; Carbon, Cold-Finished, Standard Quality

### 1.3 SUBMITTALS

- A. Shop Drawings: Contractor shall furnish complete shop drawings for all equipment specified in various sections, together with all piping, valves, and controls for review by Owner's Representative in accordance with Section 01330, Submittal Procedures.
- B. Operators and Maintenance Data: Contractor shall provide operations and maintenance data for all equipment furnished for Work. The data shall be compiled into multiple three-ring binders. Refer to specification Section 01782, Operation and Maintenance Data for specific requirements.
- C. Tools: Contractor shall supply one complete set of special wrenches and other special tools necessary for assembly, adjustment, and dismantling of equipment. All tools shall be of best quality hardened steel forging with bright, finish wrench heads shall have work faces dressed to fit nuts. All tools shall be suitable for professional work and manufactured by a recognized supplier of professional tools such as Snap On, Crescent, Stanley, or equal. The set of tools shall be neatly mounted in a labeled toolbox of suitable design provided with a hinged cover.

- D. Spare Parts: Contractor shall obtain and submit from Manufacturer a list of suggested spare parts for each piece of equipment. After approval, Contractor shall furnish such spare parts suitably packaged, identified with equipment number, and labeled. Contractor shall also furnish name, address, and telephone number of nearest distributor for each piece of equipment. All spare parts are intended for use by Owner, only after expiration of guarantee period.

#### 1.4 QUALITY ASSURANCE

- A. Inspection, Startup, and Field Adjustment: Contractor shall demonstrate that all equipment meets specified performance requirements. Contractor shall provide services of an experienced, competent, and authorized service representative of Manufacturer of each item of major equipment who shall visit Site to perform the following tasks:
  - 1. Assist Contractor in installation of equipment.
  - 2. To inspect, check, adjust if necessary and approve equipment installation.
  - 3. To start-up and field-test equipment for proper operation, efficiency, and capacity.
  - 4. To perform necessary field adjustments during test period until equipment installation and operation are satisfactory to Owner's Representative.
  - 5. To instruct Owner's personnel in operation and maintenance of equipment. Instruction shall include step-by-step trouble shooting procedures with all necessary test equipment.
- B. Costs: The costs of all inspection, startup, testing, adjustment, and instruction work performed by said factory-trained representatives shall be borne by Contractor.
- C. Public Inspection: It shall be responsibility of Contractor to inform local authorities, such as building and plumbing inspectors, fire marshal, OSHA inspectors, and others, to witness all required tests for piping, plumbing, fire protection systems, pressure vessels, safety systems, etc., to obtain all required permits and certificates, and pay all fees.
- D. Tolerances: Tolerances and clearances shall be as shown on shop drawings and shall be closely adhered to. Machine work shall in all cases be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts. Members without milled ends and which are to be framed to other steel parts of structure may have a variation in detailed length of not greater than 1/16-inch for members 30 feet or less in length, and not greater than 1/8-inch for members over 30 feet in length.
- E. Machine Finish: The type of finish shall be most suitable for application and shall be shown in micro-inches in accordance with ANSI B46.1. The following finishes shall be used:
  - 1. Surface roughness not greater than 63 micro-inches shall be required for all surfaces in sliding contact.
  - 2. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.

3. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.
  4. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.
- F. Manufacturer's Experience:
1. Unless otherwise directed by Owner's Representative, all equipment furnished shall have a record of at least 5 years of successful, trouble free operation in similar applications, from same Manufacturer.
  2. The Manufacturer shall also have sufficient installation experience and financial stability to ensure long-term capability to furnish, install, and service equipment.
- G. Requirements of Regulatory Agencies: Comply with all applicable codes, rules, and regulations.
- H. References: Comply with referenced standards as listed in individual sections.
- I. Fees and Permits: Obtain required permits necessary to execute Work under this division.
- J. All pressure vessels, safety devices and appurtenances shall comply with standards of and bear stamp of ASME.
- K. All electrical devices and wiring shall comply with standards of CEC. All devices shall be UL listed and so identified.

## **1.5 DRAWINGS**

- A. Drawings are diagrammatic and show general design, arrangement and extent of systems. Do not scale drawings for roughing in measurements, nor use as shop drawings. Make field measurements and prepare shop drawings as required. Coordinate Work with shop drawings of other specification divisions.

## **1.8 PRODUCT HANDLING**

- A. Protect material, equipment, and apparatus provided under this section from damage, water and dust, both in storage and installed, until final acceptance. Provide temporary storage facilities for material and equipment. Material, equipment, or apparatus damaged because of improper storage or protection will be rejected.

## **1.9 JOB CONDITIONS**

- A. Special Requirements:
1. Maintain emergency and service entrances usable to pedestrian and vehicle traffic at all times. Where trenches are cut, provide adequate bridging for traffic.
  2. Coordinate shutdown of water, wastewater, or heating systems.

- B. Schedule of Work: Arrange Work to comply with schedule of construction. In scheduling, anticipate means of installing equipment through available openings in structure.
- C. Protection:
  - 1. Completely cover motors and other moving machinery to protect from dirt, dust, and water during construction.
  - 2. Cap all openings in pipe and ductwork to protect against entry of foreign matter.
  - 3. Protect premises and Work of other divisions from damage arising out of installation of Work of this division.
  - 4. Perform Work in manner precluding unnecessary fire hazard.

### **1.10 EQUIPMENT AND MAINTENANCE INSTRUCTIONS**

- A. See Section 01782.

### **1.11 SPECIAL TOOLS**

- A. At completion of Work, provide one set of special tools required to operate, adjust, dismantle, or repair any equipment of this division, as specified in individual sections for specific pieces of equipment. Special tools mean those not normally found in possession of mechanics or maintenance personnel.

## **PART 2 PRODUCTS**

### **2.1 GENERAL REQUIREMENTS**

- A. High Noise Level Location. Contractor shall provide one personal hearing protection station, as specified herein, at each high noise level location. Said locations are defined as follows:
  - 1. Outdoor Location: Any single equipment item or any group of equipment items that produce noise exceeding OSHA noise level requirements for a 2-hour exposure. Where such equipment is separated by a distance of more than 20 feet, measured between edges of footings, each group of equipment shall be provided with a separate hearing protection station.
  - 2. Indoor Location:
    - a. Any single equipment item, or any group of equipment items, located within a single room not normally occupied, that produces noise exceeding OSHA noise level requirements for a 2-hour exposure.

- b. Any single equipment item, or any group of equipment items, located within a single room normally occupied by workers that produces noise exceeding OSHA noise level requirements for an 8-hour exposure.
  - c. The Contractor must submit to Owner's Representative noise level readings for all indoor locations. If noise levels exceed limits stated above Contractor shall propose corrective action and submit to Owner's Representative for approval. All costs associated with corrective action shall be responsibility of Contractor.
- B. Personal Hearing Protection: Contractor shall supply, in their original unopened packaging, three pairs of high attenuation hearing protectors for all buildings where process equipment is located. The ear protectors shall be capable of meeting requirements of ANSI S12.6 and shall produce a noise level reduction of 25 dBA at a frequency of 500 Hz. The hearing protectors shall have fluid filled ear cushions and an adjustable, padded headband. The protectors shall be stored in a weatherproof, labeled, steel cabinet, furnished by Contractor and mounted in an approved location near noise producing equipment.
- C. Service Factors: Service factors shall be applied in selection or design of mechanical power transmission components. Unless otherwise specified, the following load classifications shall apply in determining service factors:

<u>Type of Equipment</u>	<u>Load Classification</u>
Pump:	Centrifugal Uniform Moderate Shock

- D. For service factors of electric motors, see Division 16. Where load classifications are not specified, best modern practice shall be used.
- E. Welding: Unless otherwise specified or shown, all welding shall conform to the following:
1. Latest revision of ANSI/AWWA D100.
  2. Latest revision of AWWA C206.
  3. All composite fabricated steel assemblies which are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds to prevent entrance of air or moisture.
  4. All welding shall be by metal-arc method or gas-shielded arc method as described in American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of AWS. Qualification of welders shall be in accordance with AWS Standards governing same.
  5. In assembly and during welding, component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by AWS code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and

dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

- F. Protective Coating: All equipment shall be painted or coated in accordance with Section 09960, Coatings, unless otherwise indicated. Non-ferrous metal and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.
- G. Protection of Equipment: All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. All equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers should be avoided, to prevent accumulation of condensate in gears and bearings. Space heaters shall be provided to prevent condensation.
- H. Identification of Equipment Items: Each item of equipment shipped shall have a legible identifying mark corresponding to equipment number shown or specified for particular item.
- I. Vibration Level: All equipment subject to vibration shall be provided with restrained spring-type vibration isolators or pads per Manufacturer's written recommendations.
- J. Shop Fabrication: Shop fabrication shall be performed in accordance with Contract Documents and Owner's Representative-approved shop drawings.
- K. All mechanical equipment to be shipped disassembled shall be assembled in Manufacturer's shop to insure proper fitting of parts, then match-marked for erection, and disassembled for shipment.
- L. Contractor shall be responsible for locating and installing sleeves, inserts, and supports as required during stages of construction.
- M. Contractor shall be responsible for making minor changes in piping, and equipment locations due to structural obstructions or conflicts with Work specified in other divisions.

## **2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS**

- A. Equipment Supports:
  - 1. All equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. Supports and anchorage of all equipment shall be designed in accordance with the requirements of Chapter 13 of ASCE 7-05. The component Importance Factor "IP" taken as 1.0 for obtaining seismic forces.
  - 2. Wind loads shall be based on ASCE Exposure Category C, with Importance Factor "I" taken as 1.15, and Topographic Factor taken as 1.0.



3. Calculations for anchorages shall be signed by an engineer registered in the State of California. Any equipment less than 200 lbs. does not require anchorage calculations.
- B. Equipment Foundations: Equipment foundations shall be as per Manufacturer's written recommendations. All mechanical equipment, tanks, control cabinets, etc., shall be mounted on minimum 3.5-inch high concrete bases, as shown on standard structural details, unless otherwise shown or specified.
- C. Shop Drawings: Shop drawings shall be submitted to Owner's Representative for review in accordance with requirements of Section 01330, Submittal Procedures. Shop drawings will be considered incomplete unless clear, concise calculations are presented showing equipment anchorage forces and capacities of anchorage elements provided by Contractor.

### **2.3 PIPE HANGERS, SUPPORTS, AND GUIDES**

- A. All pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment.

### **2.4 FLANGES AND PIPE THREADS**

- A. All flanges on equipment and appurtenances provided under this section shall conform to ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ANSI/ASME B1.20.1.

### **2.5 COUPLINGS**

- A. Flexible couplings shall be provided between driver and driven equipment to accommodate slight angular misalignment, parallel misalignment, end float, and to cushion shock loads. Where required for vertical shafts, 3-piece spacer couplings or universal type couplings for extended shafts shall be installed.
- B. The Contractor shall have equipment Manufacturer select or recommend size and type of coupling required to suit each specific application.
- C. Taper-lock bushings may be used to provide for easy installation and removal on shafts of various diameters.
- D. Where universal type couplings are shown, they shall be of the needle bearing type construction, equipped with commercial type grease fittings.

### **2.6 SHAFTING**

- A. General: All shafting shall be continuous between bearings and shall be sized to transmit power required. Keyways shall be accurately cut in line. Shafting shall not be turned down at ends to accommodate bearings or sprockets whose bore is less than diameter of shaft. All shafts shall rotate in end bearings and shall be turned and polished, straight, and true.

- B. Materials: Shafting materials shall be appropriate for type of service and torque transmitted. Environmental elements such as corrosive gases, moisture, and fluids shall be taken into consideration. Materials shall be as shown or specified unless furnished as part of an equipment assembly.
  - 1. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.
  - 2. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.
  - 3. Corrosion-resistant shafting shall be stainless steel or Monel, whichever is most suitable for intended service.
- C. Differential Settlement: Where differential settlement between driver and driven equipment may be expected, a shaft of sufficient length with 2 sets of universal type couplings shall be provided.
- D. Shaft couplings for direct connected electric motor driven equipment 1/2 horsepower or larger shall be non-lubricated type, designed for not less than 50,000 hours of operating life. Where requirements of equipment dictate specialized features, Manufacturer may substitute coupling normally supplied for service.
- E. Coupling sizes shall be as recommended by Manufacturer for specific application, considering horsepower, speed of rotation, and type of service. The use of couplings as specified herein shall not relieve Contractor of his responsibility for precision alignment of all driver-driven units as specified by equipment Manufacturer.
- F. Couplings shall be of the pin and pre-loaded neoprene cylinder type, designed to accommodate shock loading, vibration and shaft misalignment or offset. Stub shafts shall be connected through collars or round flanges firmly keyed to their shafts, to neoprene cylinders held to individual flanges by through pins. Couplings with cylinders pinned to both coupling flanges will not be acceptable.

## **2.7 BEARINGS**

- A. Bearings shall conform to standards of Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).
- B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and other important factors shall be considered in bearing selection.
- C. All re-lubricatable type bearings shall be equipped with a hydraulic grease fitting in an accessible location and shall have sufficient grease capacity in bearing chamber.
- D. All lubricated-for-life bearings shall be factory-lubricated with Manufacturer's recommended grease to insure maximum bearing life and best performance.
- E. Bearing Life: Except where otherwise specified or shown, all bearings shall have a minimum L-10 life expectancy of 10 years or 40,000 hours, whichever occurs first. Where so specified, bearings shall have a minimum rated L-10 life expectancy corresponding to type of service, as follows:

<u>Type of Service</u>	<u>Design Life (years)</u>	<u>L-10 Design Life (hours)</u>
8-Hour or 16-hour shift	10	40,000
Continuous	10	60,000

- F. Bearing housings shall be of cast iron or steel and bearing mounting arrangement shall be as specified or shown, or as recommended in published standards of Manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.
- G. Sleeve-type bearings shall have a Babbitt or bronze liner.

## **2.8 GEARS AND GEAR DRIVES**

- A. Unless otherwise specified, gears shall be of helical or spiral-bevel type, designed and manufactured in accordance with AGMA Standards, with a minimum service factor of 1.7, a minimum L-10 bearing life of 60,000 hours and a minimum efficiency of 94 percent. Worm gears shall not be used, unless specifically approved by Owner's Representative.
- B. All gear speed reducers or increasers shall be of enclosed type, oil- or grease- lubricated and fully sealed, with a breather to allow air to escape but keep dust and dirt out. The casing shall be of cast iron or heavy duty steel construction with lifting lugs and an inspection cover for each gear train. An oil level sight glass and an oil flow indicator shall be provided, arranged for easy reading.
- C. Gears and gear drives as part of an equipment assembly shall be shipped fully assembled for field installation.
- D. Material selections shall be left to discretion of Manufacturer, provided the above AGMA values are met. Input and output shafts shall be adequately designed for service and load requirements. Gears shall be computer-matched for minimum tolerance variation. The output shaft shall have 2 positive seals to prevent oil leakage.
- E. Oil level and drain location relative to mounting arrangement shall be easily accessible. Oil coolers or heat exchangers with all required appurtenances shall be furnished when necessary.
- F. Where gear drive input or output shafts have to connect to couplings or sprockets supplied by others, Contractor shall have gear drive Manufacturer supply matching key taped to shaft for shipment.

## **2.9 DRIVE CHAINS**

- A. Power drive chains shall be commercial type roller chains and meet ANSI Standards.
- B. A chain take-up or tightener shall be provided in every chain drive arrangement to provide easy adjustment.
- C. A minimum of one connecting or coupler link shall be provided with each length of roller chain.

- D. Chain and attachments shall be of Manufacturer's best standard material and suitable for process fluid.

## **2.10 SPROCKETS**

- A. Sprockets shall be used in conjunction with all chain drives and chain-type material handling equipment.
- B. Unless otherwise specified, materials shall be as follows:
  1. Sprockets with 25 teeth or less, normally used as a driver, shall be made of medium carbon steel in the 0.40 to 0.45 percent carbon range.
  2. Type A and B sprockets with 26 teeth or more, normally used as driven sprockets, shall be made of minimum 0.20 percent carbon steel.
  3. Large diameter sprockets with Type C hub shall be made of cast iron conforming to ASTM A 48, Class 30.
- C. All sprockets shall be accurately machined to ANSI Standards. Sprockets shall have deep hardness penetration in tooth sections.
- D. Finish bored sprockets shall be furnished complete with keyseat and set screws.
- E. To facilitate installation and disassembly, sprockets shall be of the split type or shall be furnished with taper-lock bushings as required.
- F. Idler sprockets shall be furnished with brass or Babbitt bushings, complete with oil hole and axial or circumferential grooving. Steel collars with set screws may be provided in both sides of hub.

## **2.11 V-BELT DRIVES**

- A. V-belts and sheaves shall be of best commercial grade and shall conform to ANSI, MPTA, and RMA Standards.
- B. Unless otherwise specified, sheaves shall be machined from finest quality gray cast iron.
- C. All sheaves shall be statically balanced. In some applications where vibration is a problem, sheaves shall be dynamically balanced. Sheaves operating at belt speeds exceeding 6,500 fpm may be required to be of special materials and construction.
- D. To facilitate installation and disassembly, sheaves shall be furnished complete with taper-lock or QD bushings as required.
- E. Finish bored sheaves shall be furnished complete with keyseat and set screws.
- F. Sliding motor bases shall be provided to adjust tension of V-belts.
- G. V-belt with cast iron sheaves rated not less than 1-1/2 times motor horsepower.

- H. Motor Sheaves: Motors 5 horsepower and less for belt driven equipment shall have adjustable pulleys. Correct pitch diameter sheaves to match motor HP shall be furnished.
- I. Multiple V-belts shall be matched sets.

## **2.12 DRIVE GUARDS**

- A. All power transmission, prime movers, machines, shaft extensions, and moving machine parts shall be guarded to conform to Division of Industrial Safety General Industrial Safety Orders latest minimum 10 gage expanded; flattened steel with smooth edges and corners, galvanized after fabrication and securely fastened. Where required for lubrication or maintenance, guards shall have hinged and latched access doors.
- B. All equipment with exposed moving parts which operates automatically or by remote control shall be identified by signs reading "CAUTION - AUTOMATIC EQUIPMENT - MAY START AT ANY TIME". Signs shall be 10 inches by 14 inches in size and shall be constructed of corrosion-proof material with a heavy duty porcelain enamel finish or 1/8" thick butyrate or fiberglass. Letters shall be white in a red oval on a black background. Signs shall be installed near exposed moving parts.

## **2.13 FLEXIBLE CONNECTORS**

- A. Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment.

## **2.14 INSULATING CONNECTIONS**

- A. Insulating bushings, unions, couplings, or flanges, as appropriate, shall be used when joining pipes of dissimilar metals and where indicated in Contract Documents.

## **2.15 GASKETS AND PACKINGS**

- A. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions Gaskets for wastewater and sewerage applications shall be Buna "N", grade 60, or equivalent suitable elastomer. The rubber in gasket shall meet the following specifications:
  - 1. Color - Jet Black.
  - 2. Surface - Non-blooming.
  - 3. Durometer Hardness - 74±5
  - 4. Tensile Strength – 1000 psi Minimum
  - 5. Elongation – 175 percent Minimum
- B. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet requirements of ASTM D2000, AA709Z, meeting

Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with piping service and fluid utilized.

- C. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with fluid being used. Chevron-type "V" packing shall be Gatlock No. 432, John Crane "Everseal," or equal.
- D. Packing around rotating shafts (other than valve stems) shall be "O"-rings, stuffing boxes, or mechanical seals, as recommended by Manufacturer and approved by Owner's Representative.

## **2.16 NAMEPLATES**

- A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain Manufacturer's name, model, serial number, size, characteristics, and appropriate data describing machine performance ratings.

## **2.17 SAFETY REQUIREMENTS**

- A. Where work areas are located within a flammable or toxic gas environment, suitable gas detection, ventilating, and oxygen deficiency equipment shall be provided. Workers shall be equipped with approved breathing apparatus.

## **2.18 OVERLOAD PROTECTION**

- A. Unless otherwise specified in individual equipment sections, all equipment drives incorporating overload protection shall be provided with an overload protection device as follows:
  - 1. Mechanical System. The overload protection shall be a mechanical device to provide for reliable protection in event of excessive overload. It shall be a ball detent type designed for long term repeatability and life. It shall be infinitely adjustable by a single adjusting nut. Once set it shall be tamperproof, and incorporate a torque monitoring and control system, it shall activate an alarm set for 85 percent, and a motor cutout switch set for 100 percent of maximum continuous running torque. A visual torque indication shall be provided and oriented so that it may be read from walkway. The dial shall be calibrated from 0 to 100 percent of maximum continuous running torque. The design of torque limiter should initiate mechanical disengagement of drive upon overload. Each unit shall be suitable for outdoor/corrosive environments with a protective finish, corrosion inhibiting lubricants and a stainless steel cover.
  - 2. Electronic System:
    - a. As an alternative to mechanical system, overload protection may be an Electronic Torque Monitoring Control System capable of displaying torque, rpm's, one level of overload, and two levels of overload of drive system. It shall incorporate a time-delay for start-up and a voltage monitoring and compensation circuit for up to +15 percent variation.

- b. The overload device shall have an enclosure suitable for outdoor installation at temperatures of 0-70 degrees C, and relative humidity up to 95 percent. A visual torque dial shall be provided and oriented so that it can be easily read from walkway.
  - c. The torque monitoring system shall be calibrated to: alarm and shut down system in event torque drops to 50 percent of normal running; alarm at 85 percent of maximum continuous running torque and shut down motor at maximum continuous running torque of equipment. The system shall be calibrated at factory of equipment Manufacturer and it shall be capable of monitoring twice maximum continuous running torque of equipment.
- B. Manufacturers, or equal:
- 1. American Autogard Corporation
  - 2. Ferguson Machine Company

## **2.19 FABRICATED STEEL**

- A. All steel members used in fabrication of equipment shall conform to requirements of "Specifications for Structural Steel", ASTM A36. All stainless steel shall be Type 316 unless otherwise specified.
- B. Design and fabrication of Structural Steel Members shall be in accordance with latest edition of AISC "Specifications for Design, Fabrication, and Erection of Structural Steel Plates, Bars and Strip", Designation A-123, or of ASTM Standard Specifications for Zinc Coating (Hot Dip) or Iron and Steel Hardware, Designation A153067, as appropriate for buildings. All welding shall conform to latest standards of American Welding Society.
- C. All parts shall be amply proportioned for all stresses which may occur during fabrication, erection, and operation.

## **2.20 BOLTS, NUTS, AND WASHERS**

- A. Bolts for equipment assembly shall be hexagonal, refined bar iron, except where equipment body is stainless steel, aluminum, or bronze alloy, bolts shall be same corrosion resistant material. Nuts shall be hexagonal, of same metal as bolts. All threads shall be clean cut and shall conform to U.S. Standard B1.1 for Unified Screw Threads.

## **2.21 EQUIPMENT MOUNTS, GROUTING, AND VIBRATION ISOLATION**

- A. Equipment mountings shall be as shown. Where a steel or cast base is shown between equipment and a concrete pedestal, it shall be painted after fabrication in conformance with applicable provisions of Section 09960. It also shall be equipped with drain pans and drain connections, where applicable.
- B. All concrete plan dimensions for bases or pedestals shall be at least 2 inches larger in each dimension than steel or cast base installed thereon. Conduits, piping connections, drains, etc., shall be installed as shown on Drawings, and/or standard mechanical details.

- C. Where specified or noted in Drawings, equipment including base, shall be mounted on or suspended from vibration isolators to prevent transmission of vibration and mechanically transmitted sound to supporting structure. Vibration isolation available internally in equipment unit is not equivalent and shall not be provided when vibration isolation as specified herein is required. Normally provided internal vibration isolators need be replaced with rigid supports in such cases.
- D. Details of vibration isolators where required by certain units of mechanical equipment are included in Specifications for furnishing and installing those units.
- E. Furnish all necessary materials and construct suitable raised concrete foundations for all equipment installed, even though such foundations may not be indicated on Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.
- F. In setting pumps, motors, and other items of equipment customarily grouted, make an allowance of at least one inch for grout under equipment bases. All shims shall be removed. Unless otherwise approved, all grout shall be an approved non-shrink grout.
- G. Grout shall be mixed and placed in accordance with Manufacturer's installation instructions. Where practicable, grout shall be placed through grout holes in base and worked outward and under edges of base and across rough top of concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around top edge of finished foundation.
- H. Where such procedure is impracticable, method of placing grout shall be as approved. After grout has hardened sufficiently, all forms, hoppers and excess grout shall be removed, and all exposed grout surfaces shall be patched in an approved manner, if necessary, given a burlap-rubbed finish, and painted with at least two coats of an approved paint.

## **2.22 ANCHOR BOLTS**

- A. General:
  - 1. Anchor bolts for all equipment and appurtenances shall be furnished and installed as specified herein and/or as shown on Drawings. Anchor bolting for equipment supplied without vibration isolation mounts shall be designed to withstand dynamic shear and overturning forces which could be developed by ground level seismic accelerations of 0.4 g in any direction. For calculation purposes, test accelerations shall be applied to centroid of operating weight (dead plus live loads, including any integral supports) of unit. Anchor bolt holes in equipment support frames shall not exceed bolt diameters by more than 25 percent, up to a limiting maximum over-sizing of 1/4 inch. Minimum anchor bolt diameter shall be 1/2 inch. All anchor bolts shall be furnished with leveling nuts, faces of which shall be tightened against flat surfaces as shown to not less than 10 percent of bolt's safe tensile stress.
  - 2. It shall be responsibility of equipment Manufacturer to determine number, size, and location of all anchor bolts to be set in concrete. Anchor bolts, nuts, and washers may be plain steel, except that where shown on drawings or in wet or corrosive



locations they shall be Type 316 stainless steel. Unless indicated otherwise, anchor bolts for field tests may be plain steel bolts. All anchor bolts shall be furnished by equipment Manufacturer.

3. Obtain anchor bolt templates from equipment Manufacturer to aid in locating anchor bolts in concrete pad.
4. No equipment shall be anchored to vertical structural elements without written approval of Owner's Representative.

B. Seismic Considerations:

1. For all equipment with an operation weight of 1,000 pounds or more (250 pounds, in case of vibration isolated equipment having seismic restraints) in addition to above requirements, submit detailed calculations for review by Owner's Representative which demonstrates that anchor bolting will not fail in shear or in tension. Calculations shall include following steps as a minimum:
  - a. Determination of operating weight and centroid of equipment, if not already completed.
  - b. Determination of shear and overturning forces at each anchorage due to a force equal to 0.4 times operating weight of equipment being applied at centroid in each direction along three principal orthogonal axes (use values obtained in dynamic analysis in case of seismically restrained vibration isolated equipment).
  - c. Determination of shear and tension forces which must be developed by anchor bolts at each support to resist forces calculated in Paragraph b.
  - d. Selection of anchor bolting details based on maximum shear and tension forces calculated in Paragraph c.
2. Vibration-isolated equipment shall be provided with snubbers capable of retaining equipment in its designated locations without any material failure or deformation of snubbers when exposed to a vertical or horizontal force at contact surface equal to 100 percent of operating weight of equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.
3. Inasmuch as most anchorage of equipment is to be made of poured-in-place concrete elements, it is imperative that types of anchorage be coordinated with Contractor so that anchorage may be installed at time of pouring. If calculations and anchorage details are not submitted prior to pouring of concrete, Contractor will become responsible for any strengthening of concrete elements because of superimposed seismic loading.
4. All piping, raceways, ductwork, accessories, appurtenances, etc., furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its operating weight without excessive deflection. This force shall be considered acting at center of gravity of piece under consideration.

5. Piping with flexible connection and/or expansion joints shall be anchored such that intended uses of these joints are maintained in piping system.

## **2.23 ELECTRIC MOTORS**

### **A. General:**

1. Standards - Motors shall be built in accordance with IEEE Standards, NEMA Standard MG1, latest revision, and to requirements specified herein. Where a conflict may exist, these specifications take precedence.
2. Type: Motors specified herein are three-phase squirrel cage for 7.5 HP and above; or single-phase types for less than 7.5 HP.
3. Rating:
  - a. Each motor shall develop ample torque for its required service throughout its acceleration range at a voltage 10 percent below nameplate rating. Where detailed on Electrical Drawings to be operated on a reduced voltage starter, motor shall develop ample torque under conditions imposed by reduced voltage starting method.
  - b. The motor shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading.
  - c. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient unless noted otherwise.
4. Specific motor data such as HP, Service Factor, RPM, enclosure type etc., is specified under detailed specification for mechanical equipment with which motor is supplied.

**B. Nameplates:** The motor Manufacturer's nameplates shall be engraved or stamped on stainless steel and fastened to motor frame with stainless steel screws or drive pins. Nameplates shall indicate clearly all of items of information enumerated in NEMA Standard MG1-10.38 or MG1-20.60, as applicable.

**C. Submittal Data:** Submittal of motor data for acceptance shall include complete nameplate data in accordance with NEMA Standards cited above and, in addition, following for motors 3 hp or larger:

1. Ambient temperature rating.
2. Service factor.
3. Efficiency at 1/2, 3/4 and full load.
4. Power factor at 1/2, 3/4 and full load
5. Motor outline, dimensions and weight.
6. Descriptive bulletins, including full description of insulation system.

7. Bearing design data
  8. Special features (i.e., space heaters, temperature detectors, etc.)
- D. Condensation Heaters: Condensation heaters, where specified under detailed mechanical specifications shall be of cartridge or flexible wrap around type installed within motor enclosure adjacent to core iron. Heaters shall be rated for 120 V, single phase with wattage as required. The heater wattage and voltage shall be embossed on motor nameplate. Power leads for heaters shall be brought out at motor lead junction box.
- E. Winding Temperature Detectors: Where specified under detailed mechanical specifications for individual equipment or on all A.C. motors to be connected to a variable speed drive, there shall be a factory installed winding temperature detector with leads terminating in main conduit box. This device shall protect motor against damage for overheating caused by single phase, over load, high ambient, abnormal voltage, locked rotor, frequent starts or ventilation failure. The protective device shall have normally closed contacts. Essential auxiliary relays and controls shall be mounted in controller enclosure. Not less than two (2) detectors shall be furnished with each motor requiring such detector with one left as a spare.
- F. Single Phase Motors:
1. General - Unless otherwise specified, motors smaller than 143T (1/2 hp) frame shall be single phase, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for application.
  2. Voltage - Motors shall be rated for operation at 115 volts, single phase, 60 Hz. Should unusual conditions require a three-phase motor on a frame smaller than 143T, it shall be designed for 200 volts, three phase, 60 Hz, but only after written approval has been received from Owner's Representative.
  3. Enclosure - Motors shall be totally-enclosed in conformity with NEMA Standard MG1-10.35. Small fan motors may be open type if suitably protected from moisture, dripping water and lint accumulation.
  4. Locked rotor current shall not be greater than specified in NEMA Standard MG1-12.32, Design "N".
  5. Bearings - Motors shall be provided with sealed ball bearings lubricated for 10 years normal use.
- G. Three Phase Motors - Frames 143T through 449T
1. General:
    - a. All motors 1/2 HP and larger shall be on a NEMA frame 143T or larger. Motors shall be designed and connected for operation on a 240 or 480 volt, 3 phase, 60

hertz alternating current system, as applicable. Dual voltage (230/460) rated motors are acceptable.

- b. All motors shall be NEMA Design B, normal starting torque unless noted otherwise, Starting KVA/HP (Locked rotor) shall not exceed values given in NEMA Standard MG1-10.37. Motors shall be manufactured by U.S. Motors, General Electric, Westinghouse, Reliance, or equal.

2. Bearings:

- a. Anti-friction motor bearings shall be designed to be re-greasable and initially shall be filled with grease suitable for ambient temperatures to 40 degrees C. Bearings shall be AFBMA Types BC or RN, heavy duty, or shall otherwise be shown to be suitable for intended application in terms of B-10 rating life, Class M3 or better.
- b. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type as manufactured by Alemite Division of Stewart-Warner Corporation.

3. Insulation - Insulation systems shall be Class B or F (except as modified below) and shall be Manufacturer's premium grade, resistant to attack by moisture, acids, alkalies, and mechanical or thermal shock.

4. Enclosures:

- a. Motors shall have a cast iron frame and cast iron or stamped steel conduit box. Conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Synthetic rubber like gaskets shall be provided between frame and conduit box and between conduit box and its cover. Motor leads shall be sealed with a non-wicking non-hygroscopic insulating material. A pad with drilled and tapped hole, not less than 1/4 inch diameter, shall be provided inside conduit box for a motor frame grounding stud.
- b. Motors weighing more than 50 pounds shall be equipped with at least one lifting lug. All hardware shall be corrosion resistant. Motors shall be delivered with Manufacturer's standard paint.
- c. The following specific features are required in addition to preceding general specifications for motor enclosures noted:
  - 1. Open drip proof: Manufacturer's standard design with Class B insulation, stamped steel motor lead junction boxes and 1.15 service factor (@ 40 degrees C).
  - 2. Totally enclosed fan cooled - TEFC motors shall include Class B insulation, cast iron junction box, 1.15 service factor (@ 40 degrees C) tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic

breather/drain devices for frames 324T and larger), upgraded insulation by additional dips and bakes to increase moisture resistance.

3. Explosion proof - Explosion proof motors shall include Class B insulation, 1.15 service factor (@ 40 degrees C). Tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain/drain devices for frames 324T and larger), UL label for Class 1, Division 1, Group D Hazardous areas.
  4. Severe Duty - Motors shall be of the corrosion resistant type conforming to motors designated by Manufacturer as "Chemical Duty", "Mill and Chemical", "Custom Severe Duty", or similar applicable Manufacturer's quality designation. Severe duty motors shall include Class F insulation (applied at Class B rise), 1.15 service factor (@ 40 degrees C), tapped drain holes (corrosion resistant plug for frames 286T and smaller automatic breather/drain devices for frames 324T and larger), epoxy finish, upgraded insulation by additional dips and bakes to increase moisture resistance.
  5. Submersible - Motors shall be housed in a watertight casing and shall have Class F insulated windings which shall be moisture resistant. Pump motors shall have cooling characteristics suitable to prevent continuous operation in a totally, partially, or non-submerged condition continuously without overheating or other damage. The power cable shall be of adequate length to allow unit to be wired as detailed on electrical drawings without splices.
- d. Efficiency - Unless otherwise specifically specified for a specific motor, motors shall be high energy efficient type. Efficiencies shall be as determined in accordance with IEEE Standard 112 and NEMA MG-1-12.59. Motors shall be U.S. Electric Motors "Premium Efficiency"; Baldor "Super-E", or equal.
  - e. Determination of shear and tension forces which must be developed by anchor bolts at each support to resist forces calculated in Paragraph b.
  - f. Selection of anchor bolting details based on maximum shear and tension forces calculated in Paragraph c.
2. Vibration-isolated equipment shall be provided with snubbers capable of retaining equipment in its designated locations without any material failure or deformation of snubbers when exposed to a vertical or horizontal force at contact surface equal to 100 percent of operating weight of equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.
  3. Inasmuch as most anchorage of equipment is to be made of poured-in-place concrete elements, it is imperative that types of anchorage be coordinated with Contractor so that anchorage may be installed at time of pouring. If calculations and anchorage details are not submitted prior to pouring of concrete, Contractor will become responsible for any strengthening of concrete elements because of superimposed seismic loading.
  4. All piping, raceways, ductwork, accessories, appurtenances, etc., furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its

operating weight without excessive deflection. This force shall be considered acting at center of gravity of piece under consideration.

5. Piping with flexible connection and/or expansion joints shall be anchored such that intended uses of these joints are maintained in piping system.

## **2.24 PRESSURE GAUGES**

- A. Pressure Gauges: ASME B40.1; phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.
  1. Case: Drawn steel brass, or aluminum with 2-1/2 inch diameter glass lens.
  2. Connector: Brass NPS ¼.
  3. Scale: White-coated aluminum with permanently etched markings.
  4. Accuracy: Plus or minus 2 percent of middle 50 percent of scale.
  5. Range: Comply with the following:
    - a. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure.
    - b. Fluids under Pressure: Two times normal operating pressure.
  6. Pressure Gauge Fittings:
    - a. Valves: NPS ¼ brass or stainless steel needle type.
    - b. Syphons: NPS ¼ coil of brass tubing with threaded ends.
    - c. Snubbers: ASME B40.5, NPS ¼ brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

## **2.25 TOOLS AND SPARE PARTS**

- A. All special tools required for exclusive operation and maintenance of respective items of equipment shall be furnished with those items of equipment by Manufacturer. This includes special tools, instruments, accessories required for proper "in-plant" adjustment, maintenance, overhaul, and operation. Tools shall be high-grade, smooth, forged, alloy tool steel.
- B. All tools and spare parts shall be carefully packed in cartons, labeled with indelible markings, and shall be adequately treated for a long period of storage. Complete ordering information including Manufacturer, part number, part name, and equipment name and number(s) for which part is to be used shall be supplied with required spare parts. The tools and spare parts shall be delivered and stored in a location as directed.
- C. Spare parts for certain equipment provided under Divisions 11, 15 and 16 have been specified in pertinent sections of Specifications. All spare parts shall be collected and stored in a designated area. In addition, an inventory listing all spare parts, equipment they are associated with, name and address of supplier, and delivered cost of each item shall be furnished. Copies of actual invoice for each item shall be furnished with inventory to substantiate delivery.

## **2.26 LUBRICANTS**

- A. All mechanical equipment with a sufficient supply of correct lubricant for starting, testing, and initial 30-day operation period shall be provided. All lubricants shall be of types recommended by applicable equipment Manufacturer. Subject to approval of equipment Manufacturer's, lubricants shall be limited to least number or types required for normal maintenance of all equipment. Not less than 90 days before date scheduled for field testing of equipment three (3) copies of a listing indicating all lubricants required for each item of mechanical equipment shall be provided. Unless otherwise noted, all grease lubrication fittings shall be of an approved standard hydraulic type.

## **2.27 LIFTING LUGS**

- A. Lifting lugs shall be provided for all equipment weighing 50 pounds or more.

## **PART 3 – EXECUTION**

### **3.1 COUPLINGS**

- A. The Contractor shall have equipment Manufacturer select or recommend size and type of coupling required to suit each specific application; installation shall be per equipment Manufacturer's printed recommendations.

### **3.2 INSULATING CONNECTIONS**

- A. All insulating connections shall be installed in accordance with Manufacturer's printed instructions.

### **3.3 PIPE HANGERS, SUPPORTS, AND GUIDES**

- A. Hangers, supports, and guides shall be spaced in accordance with ANSI/ASME B.31.1 standard, and in accordance with Contract Documents.

### **3.4 PACKAGED EQUIPMENT**

- A. When any system is furnished as pre-packaged equipment, Contractor shall coordinate all necessary space and structural requirements, clearances, utility connections, signals, and outputs with his subcontractors, to avoid later change orders.
- B. If packaged system has any additional features (as safety interlocks, etc.), other than specified, Contractor shall coordinate such features with Owner's Representative and furnish all material and labor necessary for a complete installation as required by Manufacturer, at no additional cost to Owner.

### **3.05 CLEANING**

- A. During progress of Work, keep premises reasonably free of debris, cuttings, and waste material. Upon completion of Work, and at other times as directed, remove all such debris from premises.

- B. Clean equipment and materials. Remove foreign materials including dirt, grease, splashed paint, and plaster. Restore to original condition any finish damaged.

### **3.06 PRELIMINARY OPERATION**

- A. Operate any portion of installation if requested. Such operation does not constitute acceptance of the Work as complete.

### **3.07 STARTUP SERVICE**

- A. Prior to startup, check auxiliary connections, lubrication, venting, controls, wiring, equipment for proper rotation, and install and properly set relief and safety valves to insure readiness of systems.
- B. Start and operate all systems. All mechanical equipment and systems shall be placed in service by qualified technicians who shall provide a written statement that equipment has been installed and placed in service as recommended by Manufacturer. If, in the opinion of Owner's Representative, a start-up technician is not qualified or competent to work on a particular piece of equipment, Contractor shall replace that person with one who is qualified and competent.

**END OF SECTION**



**SECTION 11121  
GRAYWATER SYSTEM**

**PART 1 - GENERAL**

**1.01 SUMMARY**

**A. Section includes:**

1. Furnish and install graywater tanks, pump systems, and appurtenances.

**B. Related sections:**

1. Additional requirements specified elsewhere:
  - a. Shop Drawings and Product Data: Section 01330
  - b. Material and Equipment: Section 01600.
  - c. Operating and Maintenance Data: Section 01730
  - d. Warranties and Guarantees: Section 01740
2. Related Work specified elsewhere:
  - a. Earthwork: Section 03300

**1.02 REFERENCES**

**A. Equipment shall comply with applicable portions of latest editions and amendments of the following:**

1. National Electrical Code (including NFPA 70).
2. Institute of Electrical and Electronic Engineers (IEEE).
3. National Electrical Manufacturers Association (NEMA).
4. American National Standards Institute (ANSI).
5. American Society for Testing and Materials (ASTM).
6. American Concrete Institute (ACI)

**1.03 DEFINITIONS (Not Used)**

**1.04 SYSTEM DESCRIPTION**

- A. 2 each fiberglass Single compartment, 1,500 gallon graywater tank,
- B. 2 each packaged pump station with integral filter and control panel

Complete installation shall meet the criteria of Napa County Department of Environmental Health requirements.

**1.05 SUBMITTALS**

**A. Shop Drawings and Product Data:**

1. Submit complete Shop Drawings and Product Data per Section 01330.
2. Submit Operation and Maintenance Manual per Section 01730.
3. Concrete Tank:

- a. Tank
- b. Risers
- c. Lids

- 4. Effluent Pumping Assemblies:
  - a. Pump Vault
  - b. Discharge Hose and Valve Assembly
  - c. Float Switch Assembly
  - d. Effluent Pump
  - e. Electrical Splice Box
  - f. Controls and Alarms

B. Operation and Maintenance Manuals:

- 1. Supply Operation and Maintenance Manual, reference Section 01730, Shop Drawings, Samples and Operational and Maintenance Manuals.
- 2. Motors: Furnish complete Operations and Maintenance Manual per Section 16222.

D. Spare Parts listing in accordance with Section 01750.

1.06 QUALITY ASSURANCE

- A. The supplier shall be regularly engaged in the business of designing and manufacturing wastewater tank effluent pumping assemblies for a minimum of ten (10) years.

1.07 DELIVERY, STORAGE AND HANDLING

A. Preparation for shipment:

- 1. Package materials and equipment to facilitate handling and protect against damage during transit, handling or storage.
- 2. Box, crate, or otherwise completely enclose and protect all equipment.
- 3. Protect equipment from exposure to elements and keep thoroughly dry and dust-free at all times.
- 4. Protect painted surfaces against impact, abrasion discoloration or other damage.
- 5. Tag or mark each item per delivery schedule or Shop Drawings.
- 6. Include complete packing lists and bills of material with each shipment.

- B. Exercise care in shipping and handling to prevent damage to equipment in accordance with Manufacturer's instructions.

1.08 PROJECT/SITE CONDITIONS (NOT USED)

1.09 SEQUENCING AND SCHEDULING (NOT USED)

1.10 WARRANTY

- A. Submit Warranty documentation in accordance with Section 01740.

## 1.11 MAINTENANCE

### A. Tools and spare parts:

1. Provide a set of all tools required for complete assembly and disassembly of pump components.
2. Provide recommended spare parts packed and labeled for storage.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

#### A. Acceptable Manufacturers:

1. The following or equal:
  - a. Orenco Systems, Inc.

### 2.02 MATERIALS

#### A. Fiberglass Tanks:

1. Fiberglass tanks shall be analyzed using finite element analysis for buried structures. Calculations shall address the following:

- strength
- buckling
- deflection of 5% of tank diameter, based on service load (including long-term deflection lag)
- buoyancy

2. Material Properties and Laminates. The laminates considered in this analysis shall be of general-purpose ortho-polyester resin with Etype fiberglass reinforcement or higher grade. The thicknesses for different regions of tanks shall be described and shown in shop drawings for each individual tank. The laminate properties listed here, along with minimum thicknesses as described herein, are considered typical design values that must be maintained during manufacturing of tanks.

- a. Typical primary strength properties are listed below:
- b. Tensile Modulus (psi) 1,000,000
- c. Ultimate Tensile strength (psi) 10,000
- d. Ultimate Compressive strength (psi) 21,000
- e. Ultimate Flexural strength (psi) 18,000
- f. Ultimate Shear In-Plane (psi) 7,800

In lieu of calculations for fiberglass tanks, supplier may elect in-situ performance testing. In-situ testing of each tank model shall include use of strain gauge and deflection gauge. The tank will be subjected to external forces equal to twice actual load. Maximum initial deflection based on test loading shall not exceed 3% of tank diameter.

Performance testing will be evaluated by a Registered Professional Engineer (P.E.). Engineer will have sole responsibility to determine maximum external loading.

3. The tank shall be constructed with a glass fiber and resin content specified by Manufacturer and with no exposed glass fibers. Any permanent metal part shall be 300 series stainless steel. Inspections may be made by Owner's Representative in supplier's yard, within plant, upon delivery and again after installation. The minimum wall thickness shall be 3/16". If wall thickness is suspected to be less than 3/16" or if delamination is suspected within any portion of tank, Owner's Representative may drill a 1/4" diameter hole through tank wall for inspection purposes. If required minimum 3/16" thickness is not found, repair if feasible shall be responsibility of Contractor. If repair is judged not feasible, tank shall be rejected.

4. The Owner's Representative shall specify minimum weight of each tank model that will be allowed. The Manufacturer will permanently mark weight of each tank on top near access hole. i. minimum tank weight shall be specified by Manufacturer's Engineer (e.g., 350 lbs for 1000-gallon tanks, 400 lbs for 1500-gallon tanks ±).

5.. Holes specified for tank shall be provided by Manufacturer. Resin or other appropriate sealant shall be properly applied to all cut or ground edges so that no glass fibers are exposed and all voids are filled.

6. EPDM gaskets, or approved equal, shall be used at inlet to join tank wall and inlet piping. ABS or Schedule 40 PVC pipe and fittings shall be used at inlets.

7. Inlet plumbing shall include an inlet tee that penetrates 18" into liquid from inlet flow line. (The depth may vary depending on tank's height; in all cases, though, inlet should extend to a level below bottom of maximum scum depth). The inlet plumbing shall allow for natural ventilation back through building sewer and vent stack.

8. Water testing shall be performed on each tank and shall be witnessed by Owner's Representative. Every tank shall be assembled by Manufacturer and filled with water to brim of access opening for a minimum of two (2) hours. The tank shall show no leakage from section seams, pinholes or other imperfections. Any leakage is cause for rejection. When leakage occurs, if tank is not rejected by Owner's Representative, an additional water test shall be made on tank after repairs have been completed, upon request by Owner's Representative. The Manufacturer shall be responsible for making all corrective measures in production or assembly necessary to ensure a completely watertight tank.

9. After installation of tank with riser is completed, each tank shall be filled with water to a point 2" into access riser and water loss measured after a two-hour period. Every tank test shall be witnessed by Owner's Representative. Any leakage shall be cause for rejection. Backfill of a depth equal to water height in riser must be in place over tank to prevent damage due to hydrostatic uplift.

## B. RISERS & LIDS:

1. Risers: Risers shall be required for access to internal vaults and access into tanks. All risers shall be constructed watertight. The risers shall be attached to tanks such that a watertight seal is provided. Risers shall extend 3" above original grade to allow for settlement and to ensure positive drainage away from access. Risers for inspection ports shall be a minimum of 18" in nominal diameter. Adhesive required to adhere PVC or fiberglass risers to either fiberglass or ABS tank adapter shall be either a two-part epoxy Model MA320 or approved equal, or a single component adhesive Model ADH100 or approved equal. To ensure product compatibility, risers, lids, and attachment components shall be supplied by a single manufacturer.
2. Lids: One lid shall be furnished with each access riser. Lids shall be Orenco Systems®, Inc. Model FL18G4BU, FL21G, FL24-4B, FL24G-4BU, or FL30G or Owner's Representative-approved equal, fiberglass with green non-skid finish, and provided with stainless steel bolts, and wrench.

Manufacturer shall provide evidence that lids have been used successfully in continuous field service for a minimum of five years to demonstrate long-term integrity and suitability for application. Lids shall be waterproof, corrosion resistant and UV resistant. Lids shall be flat, with no noticeable upward dome. A crown or dome of no more than 1/8" is allowable. Lids shall not allow water to pond on them. Lids shall have a green non-skid finish. Self-lubricating plastics, such as polyethylene, shall not be considered non-skid without addition of a non-skid coating. Lids shall form a watertight seal with top of riser. Lids shall be capable of withstanding a truck wheel load (36 square inches) of 2500 pounds for 60 minutes with a maximum vertical deflection of 1-1/2". To prevent a tripping hazard, fasteners shall not extend above surface of lid.

## C. Effluent Pumping Assemblies:

1. Pump Assembly: Filter shall have a minimum effective screen area of no less than 15.5 square feet. Pump vault shall consist of a 12" diameter, 57" deep HDPE vault with eight (8) 2" diameter holes evenly spaced around perimeter. Flow inducer to accept effluent pump shall be attached to vault.
2. Discharge Hose and Valve Assembly: 1" diameter, 150 psi PVC ball valve, 150 psi PVC check valve, PVC flex hose with working pressure rated for 100 psi, and Schedule 40 PVC pipe.
3. Float switch assembly: three switch floats mounted on a PVC stem attached to filter cartridge. Floats must be adjustable and must be removable without removing pump vault. Each float secured with a nylon strain relief bushing at splice box. Floats shall be UL or CSA listed and be rated for a minimum of 5.0A @ 120 VAC.
4. Effluent Pump: Orenco Systems, Inc. Model PF500552, or equal, ½ hp, 115 Volt AC, single phase, 60 Hz, two-wire motor, with 10 foot long extra heavy duty

electrical cord with ground. Pump shall be capable of providing a flow rate of 25 gpm against a head of 80 feet. Pump shall be UL and CSA listed as an effluent pump. Pump shall be provided with a non-prorated five-year warranty.

5. Electrical Splice Box: UL approved for wet locations, equipped with four electrical cord grips and  $\frac{3}{4}$ " outlet fitting. Also includes UL listed waterproof butt splice connectors.
6. Controls and Alarms: Shall be listed per UL 508. Panels shall be repairable in field without use of soldering irons or substantial disassembly. Shall have following standard components:
  - a. Motor start Contactor: 14 FLA, 1/2 hp, 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA)
  - b. Toggle switch: single-pole, double-throw MOA switch. 20 amps, 1 hp.
  - c. Controls Circuit Breaker: 10 amps, OFF/ON switch. Single-pole 115 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
  - d. Pump Circuit Breaker: 20 amps, OFF/ON switch. Single-pole 115 VAC, double-pole 230 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
  - e. Audio Alarm: 80 dB at 24"
  - f. Visual Alarm:  $\frac{7}{8}$ " diameter red lens, "Push-to-silence." NEMA 4, 1-watt bulb, 115 VAC.
  - g. Panel Enclosure: NEMA 4X rated. UV-resistant fiberglass; hinges and latch stainless steel. Conduit couplings provided.
  - h. S1RO Panel Ratings: 115 VAC,  $\frac{3}{4}$  hp, 14 amp, single phase, 60 Hz.
  - i. Event Counter: 115 VAC, 6-digit, non-resettable.
  - j. Elapsed Time Meter: 115 VAC, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.

## 2.04 FABRICATION

### A. Shop assembly:

1. Fully assembled at Manufacturer's shop and ready for power and piping connection.

## 2.05 SOURCE QUALITY CONTROL

### A. Source quality control:

1. Factory test pump for capacity, power requirements, efficiency at specified rated head, shutoff head, operating head extremes, and as many other points as necessary of accurate performance curve plotting.
2. Test each pump/motor assembly as being shipped to field.
3. Provide certified test results.
4. Perform tests and prepare test reports in accordance with Hydraulic Institute Standards.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. All pumping system components shall be installed in accordance with Manufacturer's recommendations, plans, and all state and local regulations.

### 3.02 FIELD QUALITY CONTROL

#### A. Tests:

1. Field testing and checkout of installation to be approved by Manufacturer's field representative.
2. Manufacturer's field representative(s) shall perform at a minimum the following and verify all meet specifications:
  - a. Visibly check entire installation of unit:
    - 1) Check ease of pump removal and proper seat between pump and connecting pipe.
  - b. Run each unit with water up to operating speed and temperature and visually check performance across entire operating range:
    - 1) Check proper rotation of units.
    - 2) Check for excessive vibration and noise.
    - 3) Verify all wiring connects and conduct a full functional test of pumping systems verifying all sequence and level controls.
  - c. Electrical motor test of each unit on each phase:
    - 1) Insulation resistance of winding phase to ground.
    - 2) Resistance readings of windings phase to phase.
    - 3) Running amperage.
    - 4) Inrush amperage.
    - 5) Voltage phase to phase.
  - d. Verify all wiring connects and conduct a full functional test of pumping systems verifying all sequence and level controls.
3. Any spare parts shipped as specified in Article 1.11 and used during start up must be replaced prior to final acceptance.

#### C. Manufacturer's field service:

1. Qualified field personnel to assist in startup and operator training. Representative(s) shall be available within two (2) weeks of request of services and shall be onsite for a period of not less than three (3) working days and shall include a minimum of two (2) trips to perform the following:
  - a. Inspect completed installation.
  - b. Supervise initial startup, adjustments, and testing.
  - c. Instruct Owner's personnel in proper operation and maintenance.
2. Manufacturer's field representatives are to furnish a written report confirming equipment:
  - a. Has been properly installed and lubricated.
  - b. Is in accurate alignment.
  - c. Is free from undue stress imposed by connecting piping or anchor bolts.
  - d. Has been operated satisfactorily under full-load conditions.
  - e. Personnel trained in all operations.

**END OF SECTION**



## **SECTION 11125**

### **COIN OPERATED SHOWER SYSTEM**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION**

- A. Provide all materials, labor, and equipment necessary to install coin operated shower system.

##### **1.2 QUALITY ASSURANCE**

- A. Manufacturing standards: Provide each coin operated shower system as a complete system produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.

##### **1.3 SUBMITTALS**

- A. Product literature showing all pertinent data on the proposed coin operated shower system.
- B. Shop Drawings showing recommended manufacturer's installation.
- C. Operation and Maintenance manuals

#### **PART 2 - PRODUCTS**

##### **2.1 DESIGN CRITERIA**

- A. The coin operated shower system shall be a solid state electronic system consisting of a control panel, solenoid valves, and coin boxes.
  - 1. Fluid Manufacturing System III (800) 443-5843, (209) 334-6144.
  - 2. Cash Master System 3 (CSM3) (888) 872-4975, (805) 692-9949.
  - 3. Approved equal.

## **2.2 MATERIALS**

- A. Control Panel
  - 1. The control panel shall be a water tight metal box with one non-resettable counter, one manual override switch, one resettable fuse, and one control module with adjustable timer for each shower.
  
- B. Coin Box
  - 1. The coin box shall be made from 12 gauge stainless steel with a 10 gauge stainless steel money door.
  - 2. Mounting: The coin box shall be recessed in the wall, flush with the shower wall surface.
  - 3. The coin box shall be able to receive coins or tokens
  
- C. Coin Drawer
  - 1. The coin drawer shall be accessed from the shower room with tamper resistant lock and shall have a 500 coin capacity.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install the coin operated shower system where indicated in accordance with manufacturer's instructions, and as indicated on the accepted Shop Drawings. All units shall be securely fastened to walls.
- B. All work shall be square, true to line, closely fitted, plumb, level, aligned, and rigid.
- C. All drilling, cutting, and fitting shall be concealed except in pipe space.
- D. Accessories shall be adjusted and left in perfect working order.
- E. Securely mount and protect low voltage wiring.

### **3.2 INSPECTION AND ADJUSTMENT**

- A. Upon completion of the installation, and as a condition of its acceptance, visually inspect the entire work of this Section; adjust all components for proper operation and straight alignment. Protect against scratching and other damage following installation.

**END OF SECTION**

**SECTION 11306  
SUBMERSIBLE WELL PUMP**

**PART 1 - GENERAL**

- 1.1 DESCRIPTION:** The work of this section consists of furnishing and installing one complete submersible deepwell turbine pump including motor and accessories.
- 1.2 SUBMITTALS:** In accordance with Section 01330.
- A. Product Data: For the following:
  - B. Pump: Include technical data on materials of construction and flow-head graph with efficiencies and horsepower requirements.
  - C. Motor
  - D. Field quality-control test reports.
  - E. Megohm test results for each pump cable splice.

**PART 2 - MATERIALS**

**2.1 PUMP CONSTRUCTION**

- A. Bowls: Type 304 stainless steel, and shall be positively locked together to insure they do not loosen during operations.
- B. Impellers: Type 304 stainless steel, statically balanced, enclosed type, securely fastened to the pump shaft with tapered split bushings.
- C. Pump bearings: shall be of type 316 stainless steel, above and below each impeller. The suction bearing and the top discharge case bearing shall be permanently greased packed.
- D. Pump shaft shall be of type 416 stainless steel, turned ground and polished. The size of the shaft shall be no less than the determined by AWWA E101.
- E. DESIGN CRITERIA
  - 1. Size of Pump Shroud: 4 inch.
  - 2. Number of Pump Stages: 9
  - 3. Maximum Diameter of Pump Bowls: 4 inch
  - 4. Maximum RPM: 3450
  - 5. Motor: 0.5 HP.
  - 6. Pump must reasonably meet this design condition:
  - 7. 10 gpm at 170 feet TDH.
  - 8. Manufacturer: Grundfos 10S-9, or equal

## **2.2 SUBMERSIBLE ELECTRIC MOTOR**

- A. The motor shall be squirrel cage induction motor designed for water-filling, water-cooling and water-lubrication. Oil or grease lubricated motors are not acceptable.
- B. The stator windings shall be directly immersible in water. The winding wire insulation shall consist of a water-proof, non-aging material of high dielectric strength. The winding insulation shall be reinforced by a nylon cover. Hermetically sealed or resin encased stators are not acceptable. The stator windings shall be tested at a potential of not less than 2500 volts while submerged in water. The insulation resistance shall be not less than 100 Megohms.
- C. The rotor shall be statically and dynamically balanced. The rotor shaft shall be fitted with stainless steel sleeves. Guide bearings shall be of lead bronze or a graphite compound. There shall be a minimum of four guide bearings supporting the rotor. The thrust bearing shall be of the two-piece type of stainless steel and graphite construction and shall be self-aligning. Motor shall have upthrust protection.
- D. The original water filling shall be retained in the motor by means of an expansion bellows in the motor base. The motor shall be equipped with a mechanical shaft seal. The motor shall be equipped with a pressure relief valve, drain plug and filling device.
- E. All exposed parts shall be protected against corrosion by a baked-on epoxy coating.

## **2.3 POWER CABLE**

- A. Power cable shall be specifically designed for deep well service.
- B. Maximum voltage drop at motor rated full load current shall be 5%.
- C. Splice kits shall be cast epoxy type.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Well pump shall be installed by qualified workmen in conformance with the manufacturer's recommendations.
- B. Cable splices shall be immersed in water and tested with a 500 volt megger prior to installation. Resistance shall exceed 500 megohms.
- C. The pump shall be tested under operating conditions. Permissible variation from rated capacities at the rated heads shall not exceed 5%. Efficiency shall not vary by over 2%. Any necessary repairs shall be paid for by the Contractor.

**END OF SECTION**

**SECTION 11312  
CLOSE COUPLED CENTRIFUGAL PUMPS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. End suction, close-coupled, centrifugal pumps.

**1.2 SUBMITTALS**

- A. As specified in Section 01300.
- B. Submit pump performance curves including head, efficiency, and horsepower vs. flow.
- C. Submit manufacturer's literature in pump configuration, materials of construction, and installation instructions.

**1.3 CLOSEOUT SUBMITTALS**

- A. As specified in Section 01770.
- B. Manufacturer's operation and maintenance data for pumps, motors, accessories and controls.
- C. Pump performance curve for each pump.
- D. Drawing showing bowl size and impeller size for each pump.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. All products in contact with potable water shall meet the requirements of NSF Standard 61 for potable water.

**2.2 PUMP**

- A. Pump shall be end suction, centrifugal type capable of delivering flows as shown. Pump shall meet all of the flow requirements in Paragraph H.
- B. Pump casing shall be cast iron with smooth water passages and fitted with a bronze replaceable wearing ring.
- C. The impeller supplied for the specified conditions shall be one piece bronze casting of a diameter not greater than 90% of the casing cutwater diameter.

- D. Pump shaft shall be carbon steel of a size and design to limit shaft deflection at the stuffing box to no more than .002 inches.
- E. Sealing of the pump liquid cavity shall be accomplished with a face type mechanical seal with Ni-Resist stationary seat, carbon washer, Buna rubber flexible members, 18-8 stainless steel spring and metal parts. Seal shall be mounted over a bronze shaft sleeve.
- F. Pump shall be close coupled to an open-drip-proof NEMA frame electric motor rated so that it operates within its stated horsepower for the full range of pump head-flow conditions without using the service factor of the motor. Motor and pump bearings shall be regreasable and sized for a minimum of 20,000 hours L10 basic rating life.
- G. Pump shall be water lubricated.
- H.

Flow/Head at Condition 1	15 gpm at 120 feet TDH
Flow/Head at Condition 2	55 gpm at 90 feet TDH
Shutoff Head (minimum)	124 feet
NPSH Available (minimum)	3.5 psi gage
Horsepower	3 hp minimum
Pump Mfr/Model	Gould 3655 1.25 x 1.5-7, 5.4 inch impeller Or equal.

**2.3 PAINT**

- A. Section 09960, Service Condition A.

**2.4 SPARE PARTS**

- A. Provide one additional mechanical seal, one complete set of o-rings and gaskets for pump.

**PART 3 - EXECUTION**

**3.1 PUMP**

- A. Install in accordance with manufacturer's recommendations and as shown.
- B. Disinfection: Before installing the new pump, all exterior parts which come in contact with the water shall be washed with chlorine solution.
  - 1. Use a 100 ppm chlorine solution. This solution may be prepared by mixing 0.8 quarts of household bleach (5% available chlorine) with 100 gallons of water.
  - 2. Wash the exterior surface of the pump column assembly and the pump bowl assembly with the chlorine solution as the assembly is being connected to the pipe.

3. After disinfection, pump until the odor of chlorine can no longer be detected in the water discharged and  $CL_2$  residual < 4 ppm.

**END OF SECTION**



**SECTION 11400**  
**COMPOSTING TOILETS**

**Part 1 - GENERAL**

**1.1 SUMMARY**

A) This Section includes Composting Toilets and appurtenances.

**1.2 SUBMITTALS**

A) Product Data: For each product indicated.

B) Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each unit required..

**Part 2 - PRODUCTS**

**2.1 COMPOST TANK**

A) The compost tank is approved under National Sanitation Foundation Standard 41.

B) The compost tank is rotationally molded using high density cross-link polyethylene resin that conforms with the following specifications:

- |   |                                     |
|---|-------------------------------------|
| 1. Density (ASTM D-1505):                       | 0.941 g/cm <sup>3</sup>             |
| 2. Tensile Strength at yield (ASTM D-638):      | 2600 PSI                            |
| 3. Impact Brittleness Temperature (ASTM D-746): | <-180° F                            |
| 4. Dart Impact (-40°C, 250 mils thickness):     | 190 ft-lbs.                         |
| 5. Env't.Stress Crack Resistance (ASTM D-1693): | >1000 hr.                           |
| 6. Wall Thickness (polyethylene):               | 3/8" nominal                        |
| 7. Weight:                                      | 800 lbs.                            |
| 8. Volume:                                      | 234 ft. <sup>3</sup> , 1747 US gal. |
| 9. Projected capacity for daily use:            | 180 uses @ ≥65°F                    |
| 10. Projected capacity for yearly use:          | 65,000 uses @ ≥65°F                 |

C) The compost tank includes an internal liquid separation tank (45 gallons) which allows compost liquid to be separated from solid compost before being automatically pumped from the compost tank. This tank is made of rotationally molded high density cross-link polyethylene which conforms to the characteristics above.

D) The compost tank includes a fiberglass baffle that creates a barrier between uncomposted and composted material. The compost tank includes a separate chamber for finished compost. The compost tank allows for maintenance from the front of the tank from a standing position.

E) Overall Dimensions:

1. Length: 103"
2. Height: 89"
3. Width: 70-1/2"
4. Working Area on Top of Composter: 53" X 51"
5. Upper Access Door: 10" x 30"
6. Compost Access Lid: 32" x 70-1/2"

## 2.2 COMPOSTER CONTROLLER

A) The composter is equipped with an automatic control device that controls composter functions, including air flow, temperature response, moistening system, liquid removal pump, maintenance light. The moistening component may be re-programmed for site conditions. The high temperature response engages the moistening system at 160°F and will run until normal temperature is restored. A second sensor shuts down the composter ventilation fan until normal temperature is restored. The composter controller components have the following specifications:

B) Solenoid Valve: 120VAC, 50/60Hz, UL and CSA listed

C) Clock: 120VAC, 0.1 watt synchronous motor, 6 on-off cycles per day, CSA listed

D) Timer: 120VAC, solid state, 0-60 seconds per event

- a. Maintenance Light: Pendant-mount incandescent bulb in a gasketed clear glass globe with die-cast aluminum housing, operates on a spring-wound timer, UL listed

E) The controller is housed in a NEMA box 10"H X 8" W X 6"D.

## 2.3 COMPOSTER FAN

A) The purpose of the ventilation fan is to create an odorless toilet room and to provide oxygen to the compost material. The fan shall be protected from corrosion. Motor and blades shall be dipped in waterproof lacquer to resist corrosion. The fan housing shall be molded from GE NORYL N190 plastic. The unit shall have 1.75" lip collars and an external terminal box with pre-wired capacitor.

B) The motor shall conform to the following:

1. Totally enclosed and suitable for high moisture, dust and lint loading
2. Class B insulation and suitable for continuous operation in air streams up to 140°F

3. 115v, 93w, 60 Hz, .8 amp with 243 cfm and free air
4. Permanently sealed ball bearing with special lubricant
5. Thermal overload protection with automatic reset
6. Backward-inclined fan blades attach to rotating motor
7. 5-year warranty
8. CSA and UL listed
9. Overall height: 7-6/8"
10. Overall diameter: 11-3/4"

#### 2.4 **COMPOSTER LIQUID REMOVAL PUMP**

- A) Each unit of the M35 is supplied with its own pump to remove compost liquid from the compost tank. The liquid removal pump has the following specifications:
- B) 115VAC, 1/6 h.p. pump, submersible float switch controlled
- C) Outlet diameter: 1" NPT
- D) Cast aluminum housing with protective epoxy coating
- E) Pump is mounted in a 5 gallon polypropylene isolation chamber with check valve

#### 2.5 **FOAM FLUSH TOILET FIXTURE**

- A) The foam flush toilet is constructed of vitreous china, ivory color. The seat and lid are ABS plastic. The foam flush toilet drains from the bottom using 4" schedule 40 plastic pipe. The drain line may bend up to 45 degrees. The water tank has knock-outs for water supply on either side. The foam flush toilet has the following electrical specifications:
  1. 120VAC, 4w continuous power consumption, 8w flushing cycle
  2. Standard toilet height: 16"
  3. Handicapped toilet height: 17-1/3"
  4. Width: 15"
  5. Length: 29"

#### 2.6 **WATERLESS URINAL ASSEMBLY**

- A) The waterless urinal is constructed of vitreous china with white "porcelain" finish for ease of cleaning. Includes one piece hanger.
- B) Height: 18.5"
- C) Width: 13 1/2"
- D) Drain: 2"

**Part 3 - Execution**

3.1 Install per Manufacturer's recommendations as shown on Drawings.

**END OF SECTION**

**SECTION 13414**  
**SHOP FABRICATED WATER STORAGE TANK**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. This specification covers furnishing of all labor, material, equipment, tools, services and erection of 10,000 gallon nominal, shop coated, welded steel water tank as shown on Drawings and specified herein.
- B. The welded steel tank shall conform to requirements of AWWA D100, latest edition.

**1.2 DESIGN CRITERIA**

- A. Design loads: The tank structure shall be designed in accordance with the following:
  - 1. Minimum capacity 10,000 gallons
  - 2. Inside diameter 12' max
  - 3. Tank height approximately 10 feet
  - 4. Earthquake Seismic zone 4
  - 5. Specific Gravity of contents 1.0
  - 6. Wind load 100 mph, Exposure Category B
  - 7. Deck load 25 psf
  - 8. Allowable Soil Bearing 1,000 psf
  - 9. Design standard AWWA D100

**1.3 HEALTH EFFECTS**

- A. The health effects of materials or products that come into contact with drinking water shall be evaluated for contaminants or impurities which may be imparted directly or indirectly to drinking water in accordance with NSF Standard 61.

**1.4 SUBMITTALS**

- A. As specified in Section 01330.
- B. Shop Drawings: Submit shop drawings of welded steel tank and all accessories for review and approval by Engineer prior to beginning any related shop fabrication or erection. Include sufficient data to show that tank and accessories conform to requirements to these Specifications.

Submittals shall include:

1. Complete structural calculations, including forces that must be resisted by foundation, maximum and allowable stresses for steel shell, floor, and roof. Tank shall be designed using rational methods in accordance with accepted engineering practice. Calculations shall be stamped and signed by a civil or structural engineer registered in the State of California.
2. Detailed fabrication and erection drawings and details for tank and all accessories. Include drawings for all shell, roof and floor penetrations and bolt holes for mounting accessories.
3. Certified mill tests on steel plate and structural members demonstrating that physical and chemical requirements of this Specification have been met.
4. Submit Supplier's certificate of compliance with NSF Standard 61.
5. Submit foundation design.
6. Submit Anchor Holdown Design.

#### **1.5 QUALIFICATIONS OF TANK MAUFACTURER AND INSTALLER**

- A. The Supplier and installer shall have 5 years experience and be a specialist in design, fabrication, and erection of welded steel tanks and appurtenances. Tank erection shall be supervised by tank Supplier trained personnel.
- B. Provide a list of at least five (5) tanks presently in potable water service designed to AWWA D100 standard, of equal or greater size, operating satisfactory for a minimum of five (5) years, including telephone number of Owner's Representative.

#### **1.6 PRODUCT HANDLING**

- A. Tank shall be transported to site in vehicle of adequate size and weight capacity for tank. Use straps to hold tank in place during transport. Use of chains will be grounds for rejection of tank.
- B. Lift tank directly from truck and place on completed foundation. Do not store tank on site.

#### **1.7 WARRANTY**

- A. The tank Supplier shall warrant tank against any defects in workmanship and materials for a period of one (1) year from date of shipment. In the event any such defect should appear, it should be reported in writing to Supplier during warranty period.

## **PART 2 – PRODUCTS**

### **2.1 TANK**

- A. The Supplier shall furnish, erect and test tank, as required by AWWA D100. The Supplier shall be completely responsible for construction and satisfactory performance of tank during guarantee period. The tank shall conform to AWWA D100 and to latest edition Uniform Building Code, and to the requirements of Drawings and these Specifications. The supplier shall submit for approval complete and detailed drawings for tank and appurtenances.
- B. Tank shell sheets shall have mild strength per ASTM A607, Grade 30 and high strength per ASTM A607, Grade 50. All shell penetrations and bolt holes for mounting of accessories shall be factory fabricated after surface preparation and prior to cleaning.

### **2.3 ROLLED STEEL STRUCTURAL SHAPES**

- A. Material shall conform to AWWA D100, Section 2.5 and ASTM A36 or ASTM A992.

### **2.6 ROOF HATCH**

- B. The tank roof shall have a curbed, upward opening 24-inches square, minimum hatch located as shown. The curb shall extend at least 4 inches above tank. The hatch cover shall be hinged and shall have locking provisions. The hatch cover lip shall extend for a distance of 2-inches down on outside of curb.

### **2.7 ROOF VENT**

- A. A 20 inch screened vent shall be provided on roof. The vent shall be fabricated to provide removable screened openings between vertical support members of vent. The screened openings of vent shall be sized by Supplier to all venting of a 300 gpm pumping rate. An effective area of 75% of screen opening shall be assumed. The screen shall consist of one layer of Type 316 stainless steel: 16 x 16 x 0.018 wire mesh insect screen.

### **2.8 TANK ACCESSORIES**

- A. 1 – 24” shell manhole: Provide a 24”, minimum, hinged shell manhole located as shown on Drawings. The center of manhole shall be located 30 inches above bottom of tank.
- B. 2” potable outlet nozzle.
- C. 3” fill line outlet nozzle.
- D. 2” inlet nozzle.
- E. 4” overflow with downcomer and steel external overflow pipe and supports. Overflow

pipe assembly shall be galvanized.

- F. Exterior Ladder – Do not provide an external ladder.
- G. Interior Ladder - Provide an interior Fiberglass or Stainless Steel ladder with bracket assembly.
- H. Identification Plate: Provide stainless steel Supplier's nameplate listing tank serial number, tank diameter and height, and maximum design capacity.
- I. Liquid Level Indicator: Provide half-height liquid level indicator with gauge board. Superior Tank Model #2400, or equal, with Type 316 stainless steel internals and complete with float and target board assembly.

### **PART 3 – EXECUTION**

#### **3.1 TANK SITE EXCAVATION AND GRADING**

- A. Per Section 02300.

#### **3.2 FOUNDATION**

- A. Provide concrete ring wall as shown. Anchor tank to ring wall in accordance with Supplier's recommendations.

#### **3.3 PROTECTIVE COATING**

- A. General: All metal plates, supports, members and miscellaneous parts, except bolts, shall be factory coated in accordance with AWWA D102, latest edition. Field coating, other than touch-up, will not be permitted.

#### **3.4 CONSTRUCTION**

- A. Field erection of factory coated welded steel tank shall be in strict compliance with Supplier's recommendations and performed by Supplier's employees or certified erection crew. Prior to placing water in tank, a "holiday" inspection of entire tank, corners included, will be provided and performed by Supplier in presence of Owner's Representative. Touch-up coating shall be done per Supplier's recommendations where needed and as directed.

#### **3.5 CLEANING**

- A. General: Cleaning shall be done after tank placement and all connections have been made. All inside surfaces below high water level will be inspected by Owner's Representative prior to chlorination and leakage testing; touch-up shall be done as directed.
- B. Cleaning: Remove all tools, rags and any other material not part of structure or its accessories from tank interior. Thoroughly clean interior surfaces or shell floor and



accessories of tank using a high-pressure water jet, sweeping, scrubbing or other equally effective means. Discharge or otherwise remove all water, dirt and foreign material, accumulated in cleaning operation from tank. Dispose as directed by Owner's Representative

### **3.6 DISINFECTION**

- A. General: After testing has been satisfactorily completed, tank shall be disinfected.
- B. Standards: Disinfect interior surfaces accordance with AWWA C652-86.

### **3.7 LEAKAGE TESTING**

- A. Retention of chlorine solution for a 24-hour period during disinfection will also constitute tank leakage test. Repair any leaks disclosed in test, and repeat required test for leakage. After holding period, purge all highly chlorinated water from drain piping. Subject to satisfactory bacteriological sampling and testing, acceptable aesthetic quality, and adjustment of free chlorine residual to a concentration of not more than two parts per million (2 mg/l), tank may be put into service.

### **3.8 BACTERIOLOGICAL SAMPLING AND TESTING**

- A. After chlorination is completed, and before tank is placed in service, sample water from full tank and submit sample to proper authorities as directed for bacteriological testing. If results of testing are unsatisfactory (positive), repeat disinfection, sampling and testing until two consecutive samples are satisfactory (negative).

### **3.9 ANNIVERSARY INSPECTION**

- A. On or before the one year anniversary date of final acceptance of tank, and prior to end of warranty period, Contractor shall arrange for Supplier's factory trained representative to make a visual inspection of tank interior coatings and accessories, and immediate area surrounding tanks and shall notify Owner's Representative at least ten working days prior to scheduled date of inspection. The Owner's Representative will be present during inspection. A written summary of this inspection shall be filed with Owner's Representative

**END OF SECTION**

## SECTION 13500

### TENT CABINS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes Tent Cabins complete including platform, frame, fabric walls and roof, skirting, rain fly system, door, and window complete with all appurtenances.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of factory-fabricated product and process indicated
  1. Shell Wall Fabric.
  2. Rain Fly Fabric.
  3. Frame: lumber, connectors, connection details.
  4. Windows: frame, finish, glazing, screens.
  5. Doors: frame, finish, glazing, hardware.
  6. Assembly Instructions

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS, GENERAL

- A. Provide tent cabin of the highest quality construction, including frame and platform of top grade lumber, shell system engineered for a life expectancy of twelve to fifteen years, and rain fly system engineered for a life expectancy of five to seven years. Welded steel components for the eave and awning system shall be zinc plated.
- B. Dimensions:
  1. 12' x 14'.
  2. 7' walls.
  3. 4' x 3' window.
  4. 3'-0" x 6'-8" storm door.
- C. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee Board of Review.
- D. Sweetwater Bungalows, Pioneer or approved equal.

## **2.2 SHELL WALLS & RAIN FLY**

- A. One piece fabric shell is tensioned over the frame to provide a tight seal along the platform perimeter. The rain fly is draped over the shell and secured by the Eave & Awning system.
- B. 13/14 oz white laminated polyester-vinyl.
- C. Durable, waterproof, flame retardant and treated to resist mildew, and fading from ultra-violet rays.
- D. Strong tear and tensile strength. Corners, ridges and eaves are reinforced with 8" strips of hemmed vinyl.
- E. Seams are lock-stitched and electronically welded.
- F. Brass grommets.

## **2.3 SHELL CEILING**

- A. 10 oz 100% duck cotton canvas.
- B. Canvas shall be lock-stitched to vinyl wall.
- C. Waterproof, Flame retardant and mildew resistant.

## **2.4 EAVE & AWNING SYSTEM**

- A. Zinc plated Steel Components.
- B. 4 Eave Brackets .
- C. 2-4 Fly Rail Brackets.
- D. 2 Eave Hangers.
- E. 2 Rain Fly Rails - 3/4" Pipe.
- F. 4- 2"x 4" Eave Rafters.
- G. Lag Bolts / Screws.
- H. 12-20 Heavy Duty Bungee Cords.

## **2.5 WOOD FRAME**

- A. Spruce Wood
- B. 2"x4" Top & Bottom Plates, Corner Bracing, Collar Ties, Window Jambs & Sills and Rafters.
- C. 4"x4" Corner & Middle Studs, Door and Back Jambs, and Truss Posts.

- D. 4"x6" Center Ridge.

## **2.6 STORM DOOR**

- A. 32"x 80", White Clad
- B. Adjustable sliding window with screen
- C. 1"x3" Trim

## **2.7 WINDOWS**

- A. 4'x 4' & 4'x 3' Windows
- B. White enamel, Double Pane
- C. Horizontal Slider with Screen
- D. 1"x 3" Trim

## **2.8 SKIRTING**

- A. Skirting shall be exterior grade plywood primed and painted for exterior exposure on the outside, fastened with #10x2.5" exterior grade wood screws at 12" on center.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours.

### **3.2 INSTALLATION**

- A. Install on platform per Manufacturer's recommendations.
- B. Install frame level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts.
- C. Standing and Running Trim: Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.
- D. Tent Fabric: Install according to Manufacturer's written recommendations.

**END OF SECTION**

**SECTION 13600**  
**SHADE SHELTERS**

**GENERAL:**

1. All shelter components shall be designed and fabricated per the latest applicable edition of the International Building Code (IBC). Structure is typically designed for a 25 lb live load, a 90 mph wind load and applicable seismic loads, and can be designed based on specific site requirements upon request.
2. All structural members shall be designed according to the American Institute of Steel Construction (AISC) and the American Iron and Steel Institute (AISI) specifications.
3. All welding is to be done in accordance with the latest American Welding Society (AWS) standards and all welds are to develop full strength of component parts (E7081 Electrodes).
4. When required, Manufacturer shall submit site specific engineer sealed structural calculations by a registered engineer in the state of the shelter location.

**FOOTINGS & COLUMNS:**

1. Standard columns shall have a welded base plate to be surface mounted to concrete footings. All concrete material and installation shall be supplied by the owner / contractor. Anchor bolts shall be ASTM A-307 and will be provided along with bracing templates by Manufacturer. Optional direct bury columns may be provided upon request. Recommended concrete compressive strength is 3000 psi. Footing designs are available upon request.

**FRAMING MEMBERS:**

1. All frame members shall be structural steel tube ASTM A-500 Grade B with ASTM A-36 welded connection plates. Minimum steel tube wall thickness shall be 0.120 (1/8") and minimum connection plate thickness shall be 0.250 (1/4").
2. All framing connections are done using ASTM A-325 grade bolts (included with shelter) within concealed access openings from above and will later be concealed by the roofing. All roof framing shall be flush against the underside of the roof decking to eliminate the possibility of bird nesting.
3. Open framing members such as "I" beams, angle iron and "C" or "Z" channels shall not be used.

**PAINT:**

1. All frame members shall be blasted and washed to a white condition to completely rid the steel of all rust, oil, grease and contaminants. 3-6 mils of electro-statically applied epoxy

primer and 4-6 mils of electro-statically applied TGIC polyester powder coat. Final powder coat is oven cured at 400 degrees. 16 standard color choices are available with custom colors available upon request at an additional charge.

## **ROOFING & TRIM**

1. All roofing shall be 24ga. Multi-Rib exposed fastener steel panels by McElroy Metal, Inc. Roof panels are Galvalume coated with white bottom and 20 year warranted Kynar 500 top finish color in a variety of 16 standard colors. Panels shall be 3' wide pre-cut with ribs at 12" O.C. running with the slope of the roof. Fastened to steel frame using self tapping screws painted to match roof color. Standard roof slope is a 4/12 pitch with a 8'-0" high clear eave height (some shelter may vary). Other exposed fastener panel profiles as well as concealed fastened standing seam panels are available upon request at an additional charge.
2. Roof trim shall be 24ga. pre-finished Galvalume coated steel to match roof color with exposed screws in matching color.
3. Wood Decking (optional) shall be 2" x 6" (nominal) #1 Grade, single tongue and groove with V-joint bottom face, Southern Yellow Pine. 24ga. pre-finished drip flashing shall be included.

## **SHIPPING & INSTALLATION:**

1. Prior to delivery of steel members from factory to job site all members shall be wrapped in a protective wrap to protect the factory finish during shipping. Protective wrap should be removed upon receipt of delivery to avoid prolonged exposure to packaging materials which could damage factory finish. Should damage occur to the surface finish, whether during shipment or on-site, touch up paint is provided.
2. Manufacturer shall provide complete installation drawings and instructions. Installation should be performed by someone of experience and competence. It shall be the responsibility of the installer to properly assemble the shelter as described in installation documents and to construct shelter foundations as specified in supplemental engineering documents.

## **WARRANTY:**

1. Manufacturer shall warranty the structure to be free from defects in materials and workmanship under normal use for 5 years from delivery date. 5 year limited warranty is void if any damage has resulted from abnormal use, abuse, accident, vandalism, poor installation, lack of maintenance, misapplication or acts of god. The entire liability of Manufacturer and its suppliers, and the exclusive remedy shall be for Manufacturer to repair or replace at their option those materials found to be defective to match existing material.

## **SECTION 15052**

### **PROCESS PIPING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Basic process piping materials and methods.
  - 2. Basic pipe joining materials and methods
  - 3. Gaskets
  - 4. Expansion joints

##### **1.2 REFERENCES**

- A. American Society of Testing and Materials (ASTM):
  - 1. A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - 2. A 106 - Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
  - 3. D 2240 - Test Method for Rubber Property B Durometer Hardness.
- B. American Water Works Association (AWWA)
- C. Hydraulic Institute Standards (HIS)

##### **1.3 DEFINITIONS**

- A. Aboveground Piping: Piping within buildings, tunnels, or other structures without regard to elevation of piping, or exposed piping outside buildings and structures.
- B. Underground Piping: Piping actually buried in soil or cast in concrete.
- C. Underwater Piping: Piping below tops of walls in basins or concrete tanks containing water, even if piping is above maximum expected water level.
- D. Wet Wall: Wall with water on one or more sides.

##### **1.4 SUBMITTALS**

- A. Product Data: For each manufactured material and product indicated.

## 1.5 SYSTEM DESCRIPTION

### A. Piping Drawings:

1. Except in details, piping is indicated diagrammatically. Not every offset and fitting, or structural difficulty that may be encountered has been indicated on Drawings. Contractor shall supply fittings as necessary, at no additional cost, to make piping systems whole, functional and complete. Sizes and locations are indicated on Drawings.
2. Perform minor modifications to piping alignment where necessary to avoid structural, mechanical, or other type of obstructions that cannot be removed or changed.
  - a. Modifications are intended to be of minor scope, not involving a change to design concept or a change to Contract Price or Contract Times.

### B. Performance Requirements:

#### 1. Venting Piping Under Pressure:

- a. Lay piping under pressure flat or at a continuous slope without air traps, unless otherwise indicated on Drawings.
- b. Install plug valves as air bleeder cocks at high points in piping. Provide one-inch plug valves for water lines, and 2 inch plug valves for sewage and sludge lines, unless otherwise indicated on Drawings.
- c. Provide additional pipe taps with plug cocks and riser pipes along piping as required for venting during initial filling, disinfecting, and sampling.
- d. Before piping is placed into service, close plug valves and install plugs. Protect plugs and plug valves from corrosion in accordance with Section 09960.

#### 2. Restraining Piping:

- a. Restrain piping at valves and at fittings and where piping changes direction, changes sizes, and at ends.
  - 1) When piping is underground, use concrete thrust block or mechanical restraints.
  - 2) When piping is aboveground or under water, use mechanical or



structural restraints.

- 3) Determine thrust forces by multiplying nominal cross sectional area of piping by design test pressure of piping.
  - b. Provide restraints with ample size to withstand thrust forces resulting from test pressures.
    - 1) During testing, provide suitable temporary restraints where piping does not require permanent restraints.
  - c. Place concrete thrust blocks against undisturbed soil. Place concrete so piping joints, fittings, and other appurtenances are accessible for assembly and disassembly.
  - d. Provide underground mechanical restraints where specified in Piping Schedule.
3. Connections to Existing Piping:
- a. Expose existing piping to which connections are to be made with sufficient time to permit, where necessary, field adjustments in line, grade, or fittings.
    - 1) Protect domestic water supplies from contamination.
      - a) Make connections between domestic water supply and other water systems in accordance with requirements of public health authorities.
      - b) Provide devices approved by State of California to prevent flow from other sources into domestic supply system.
  - b. Make connections to existing piping and valves after sections of new piping to be connected have been tested and found satisfactory.
  - c. Provide sleeves, flanges, nipples, couplings, adapters, and other fittings needed to install or attach new fittings to existing piping and to make connections to existing piping.
4. Connections to In-Service Piping:
- a. Provisions regarding shutdown of existing facilities are specified in Section 01500.

5. Connections at Dissimilar Metals:
  - a. Connect ferrous and nonferrous metal piping, tubing, and fittings with dielectric couplings especially designed for prevention of chemical reactions between dissimilar metals.
  - b. Nonferrous metals include aluminum, copper, copper alloys, and stainless steel.

C. Piping Alternatives:

1. Provide piping in accordance with this Section, unless indicated on Drawings or specified otherwise.
2. Alternative Pipe Ratings: Piping with greater pressure rating than specified may be substituted in lieu of specified piping without changes to Contract Price. Piping of different material may not be substituted in lieu of specified piping.
3. Alternative Joint Types: Ductile iron piping with mechanical joints or push-on joints may be substituted in lieu of bell and spigot joints.
4. Valves in Piping Sections: Capable of withstanding specified test pressures for piping sections and fabricated with ends to fit piping.
5. For flanged joints, where one of joining flanges is raised face type, provide a matching raised face type flange for other joining flange.

## PART 2 - PRODUCTS

### 2.1 PIPE AND FITTINGS

- A. Black iron and galvanized steel pipe shall meet or exceed following materials and manufacturing requirements:
  - a. Pipe Standards ASTM A53, ASTM A135 or ASME/ANSI B36.10
  - b. Material Hot-dipped zinc-coated steel Type E, F or S
  - c. Marking Per ASTM A53 Section 24
  - d. Size As shown on plans and submittals
  - e. Wall Thickness: Standard weight per ASME/ANSI B36.10
  - f. Schedule 40
  - g. Joints Threading Threaded per ANSI B1.20 Use taper pipe threads (NPT) except internal straight threads may be used in couplings (NPSC)
  - h. Lubricant Teflon or Teflon tape
  - i. Malleable Iron Threaded Fittings ASTM A47, ASME/ANSI B16.3
- B. PVC, Schedule 80 Pipe: ASTM D 1785.
  - a. PVC, Schedule 80 Socket Fittings: ASTM D 2466.

## 2.2 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, BCuP Series.
- B. Soldering Flux: ASTM B 813, water-flushable type.
- C. Solder Filler Metal: ASTM B 32, lead-free type with 0.20 percent maximum lead content.

## 2.3 ESCUTCHEONS

- A. Manufacturers: One of following or equal:
  - 1. Dearborn Brass Company, Model Number 5358.
  - 2. Keeney Manufacturing Company, Model Number 102 or Number 105.
  - 3. Beaton and Corbin, Model Number 1 or Number 13.
- B. Material: Chrome-plated steel plate.

## 2.4 SEGMENTAL ANNULAR SEALS

- A. Manufacturers: One of following or equal:
  - 1. Calpico, Inc.
  - 2. Thunderline Corporation, Link-Seal.
- B. Characteristics:
  - 1. Modular mechanical type, consisting of interlocking neoprene or synthetic rubber links shaped to continuously fill annular space between pipe and wall opening.
  - 2. Assemble links solely with stainless steel bolts and nuts to form a continuous rubber belt around pipe.
  - 3. Provide a stainless steel or glass reinforced nylon pressure plate under each bolt head and nut. Isolate pressure plate from contact with wall sleeve.

## 2.5 GASKETS

- A. Gaskets for Flanged Joints in Polyvinyl Chloride and Polyethylene Piping:

1. Suitable for pressures equal and less than 150 pounds per square inch gauge, with low flange bolt loadings, temperatures equal and less than 120 degrees Fahrenheit, polymer, chlorine, caustic solutions, and other chemicals, except chemicals which liberate free fluorine including fluorochemicals and gaseous fluorine.
2. Material: Viton Rubber; 0.125 inch thick.
3. Manufacturers: One of following or equal:
  - a. Garlock.
  - b. John Crane, similar product.

**B. Gaskets for Flanged Joints in Ductile Iron, or Steel Water Piping:**

1. Suitable for hot or cold water, pressures equal and less than 150 pounds per square inch gauge, and temperatures equal and less than 160 degrees Fahrenheit.
2. Material:
  - a. Neoprene elastomer, compressed, non-asbestos fiber reinforcement.
3. Manufacturers: One of following or equal:
  - a. Bluegard, Style 3300.
  - b. Garlock.
  - c. John Crane, similar product.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

**A. Verification of Existing Conditions:**

1. Carefully locate and expose (pothole) existing structures, piping, conduits, and other facilities and obstructions which may affect construction of underground piping before starting excavation for new underground piping and appurtenances. Repair any existing piping damaged during exposure operations.
2. Verify sizes, elevations, locations, and other relevant features of existing facilities and obstructions. Determine conflicts for construction of new

underground piping and appurtenances.

3. Make piping location and grade adjustments to resolve conflicts between new piping and existing facilities and obstructions at no additional cost to Owner.

### 3.2 **INSTALLATION**

#### A. Pipe Support, Seismic Bracing and Expansion Control:

1. Piping shall be supported by anchor brackets, guides, saddles or hangers.
2. Pipe movement due to thermal expansion and internal pressure and dynamic forces shall be accommodated by pipe springing, anchors, expansion joints, and guides selected for specific purpose.
3. The details for piping support, seismic bracing, and expansion control systems shall be submitted with Contractor's piping layout drawings as product data under provisions of Section 15060.
4. Acceptable types of supports, guides, saddles, expansion joints, flexible couplings, hangers and structure attachments for general pipe support, expansion/ contraction and for seismic bracing, as well as anchorage details, are referenced in Section 15060 or shown on drawings.
5. Where a specific type of support or anchorage is indicated on drawings, then only that type shall be used at that location.
6. Piping shall be vertically supported by anchor brackets, guides, saddles or hangers and shall be seismically braced as required to resist seismic loads.
7. Supports shall be provided on each run at each change of direction.
8. Pipe supports manufactured of iron or steel shall be hot-dip galvanized after fabrication.
9. Unless otherwise specified or shown on drawings, existing pipes and supports shall not be used to support new piping.

### 3.3 **WALL AND SLAB PENETRATIONS**

- A. Provide sleeves for piping penetrations through aboveground masonry and concrete walls, floors, ceilings, roofs, pilasters, columns, piers, and beams

unless specified or otherwise indicated on Drawings.

- B. For piping 1 inch in nominal diameter and larger, provide sleeves with minimum inside diameters of 1 inch plus outside diameter of piping. For piping smaller than 1 inch in nominal diameter, provide sleeve of minimum twice outside diameter of piping.
  - 1. Arrange sleeves and adjacent joints so piping can be pulled out of sleeves and replaced without disturbing structure.
  - 2. Cut ends of sleeves flush with surfaces of concrete, masonry, or plaster.
  - 3. Seal spaces between pipes and sleeves with link-type seals when not otherwise specified or indicated on Drawings.
  - 4. Conceal ends of sleeves with escutcheons where piping runs through floors, walls, or ceilings of finished spaces within buildings.
- C. Cast couplings or wall pieces in walls for penetrations of buried rigid piping including cast iron, ductile iron, reinforced concrete, and vitrified clay through structures.
  - 1. Provide couplings or wall pieces with mechanical push-ons, or similar flexible joints at outside faces of walls.
  - 2. Provide additional similar joints in piping at transition points between trenches and structure excavations.
  - 3. For steel piping, single joints may be used in lieu of 2 joints. Locate single joints outside within 2 feet from outside faces of walls. Link Seal: Use 2 link seals where seal is used to seal at wet wall sleeves. Mount one seal on inside face of wall and other on outside face of wall. Coordinate inside diameter of wall sleeve with size of seal to provide watertight sealing.
- D. Where not indicated on Drawings, penetrations for conditions other than those specified under preceding subparagraphs shall be 1 of 3 types specified in such subparagraphs found by Owner's Representative to be most suitable for particular conditions.

### 3.4 EXPOSED PIPING

- A. Install exposed piping in straight runs parallel to axes of structures, unless indicated otherwise.
  - 1. Install piping runs plumb and level, unless otherwise indicated on

Drawings. Slope plumbing drain piping with 1/8 inch per foot downward in direction of flow.

- B. Install exposed piping after installing equipment and after piping and fitting locations have been determined.
- C. Support piping in accordance with Section 15060.
  - 1. Do not transfer pipe loads and strain to equipment.
- D. In addition to joints indicated on Drawings, provide unions, flexible couplings, flanged joints, and other types of joints or means which are compatible with and suitable for piping system, and necessary to allow ready assembly and disassembly of piping.
- E. Assemble piping without distortion or stresses caused by misalignment.
  - 1. Match and properly orient flanges, unions, flexible couplings, and other connections.
  - 2. Do not subject piping to bending or other undue stresses when fitting piping. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.
  - 3. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.
  - 4. Alter piping assembly to fit when proper fit is not obtained.
  - 5. Install eccentric reducers or increasers with top horizontal for pump suction piping.

### 3.5 **CLEANING**

- A. Piping Cleaning:
  - 1. Clean and disinfect water-distribution piping as follows:
    - 1) Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
    - 2) Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

- a) Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
  - b) After standing time, flush system with clean, potable water until chlorine level equals that of potable water remains in water coming from system. Dechlorinate water to below 0.2ppm and discharge to sewer system.
  - c) Submit water samples in sterile bottles to certified laboratory. Repeat procedure if biological examination shows evidence of contamination.
2. Prepare reports of purging and disinfecting activities.

**END OF SECTION**



## SECTION 15054

### VALVES AND ACCESSORIES FOR PROCESS PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following general-duty valves:
  - 1. PVC ball valves.
  - 2. Air release valves.
  - 3. Hose bibbs.
  - 4. Floor drains/floor sinks.
- B. See Division 2 piping sections for general-duty and specialty valves for water distribution piping.
- C. See Division 15 piping sections for specialty valves applicable to those sections only.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; furnished specialties; and accessories.

##### 1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.9 for building services piping valves.
  - 1. Exceptions: Domestic hot- and cold-water, sanitary waste, and storm drainage piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

#### PART 2 - PRODUCTS

##### 2.1 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- D. Valve Actuators:

1. Handwheel: For valves other than quarter-turn types.
  2. Lever Handle: For quarter-turn valves NPS 6 and smaller.
- E. Extended Valve Stems: On insulated valves.
- F. Valve Grooved Ends: AWWA C606.
- G. Solder Joint: With sockets according to ASME B16.18.
1. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.
- H. Threaded: With threads according to ASME B1.20.1.
- I. Valve Bypass and Drain Connections: MSS SP-45.

## **2.2 AIR RELEASE VALVE**

- A. Manufacturer:
1. Valve and Primer Corporation, APCO, Series 200.
  2. Multiplex Manufacturing Company, Crispin PL Series.
  3. Or equal.
- B. Design:
1. Pressure rating: 150 pounds psig.
  2. Inlet: As specified.
  3. Orifice Size Minimum: ¼" diameter or as shown.
- C. Materials:
1. Valve body: Cast iron
  2. Float and internal trim: Stainless steel.
  3. Seat or valve plunger: Buna-N.

## **2.3 HOSE BIBBS**

- A. Bronze body with replaceable seat disc complying with ASME A1123.18-1M for compression-type faucets. Include NPS ¾ threaded or solder joint inlet, of design suitable for pressure of at least 125 psig; integral, nonremovable, drainable hose-connection vacuum breaker; and garden hose threads complying with ASME B1.20.7 on outlet.

## **2.4 FLOOR DRAINS/SUMPS**

- A. Sumps/Floor Sink:
1. Epoxy coated cast iron.
  2. 12" x 12" square open top.
  3. Flat bottom strainer.
  4. No-hub outlet.
  5. Manufacturer:

- a. Watts FD-830, or equal.
- B. Floor Drain:
- 1. Cast-iron soil pipe and fittings.
  - 2. Provide with adjustable strainer head, floor level grate, 4-inch diameter funnel extension and provided with no-hub outlet and nickel bronze top.
  - 3. Manufacturer: One of the following or equal:
    - a. Floor drain
      - 1) Josam Company, 30000-A, a universal combination drip drain, less clamping collar.
      - 2) Zurn Industries, Inc., ZN-415 strainer.
    - b. Funnel extension:
      - 1) Josam Company, E-2.
      - 2) Zurn Industries, Inc., ZN-328.

## **PART 3 - EXECUTION**

### **3.1 VALVE APPLICATIONS**

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
- 1. Shutoff Service: Ball or gate valves.
  - 2. Throttling Service: Ball valves.
  - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Compressed-Air Piping: Use the following types of valves:
- 1. Ball Valves, NPS 2 and Smaller: Two-piece, 150 psig CWP rating, copper alloy.
  - 2. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
  - 3. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.
  - 4. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.
- D. Domestic Water Piping: Use the following types of valves:
- 1. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, NRS, bronze-mounted cast iron.
  - 2. Ball valves NPS 2 and smaller. PVC "Tru-Union".
- E. Sanitary Waste and Storm Drainage Piping: Use the following types of valves:
- 1. Ball Valves, NPS 2-1/2 and Larger:
  - 2. Swing Check Valves, NPS 2 and Smaller:
  - 3. Swing Check Valves, NPS 2-1/2 and Larger:
- F. Select valves, except wafer and flangeless types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

### **3.2 VALVE INSTALLATION**

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
  1. Swing Check Valves: In horizontal position with hinge pin level.
  2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
  3. Lift Check Valves: With stem upright and plumb.

### **3.3 JOINT CONSTRUCTION**

- A. Refer to Division 15 Section 15052 Process Piping for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### **3.4 ADJUSTING**

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

**END OF SECTION**

## SECTION 15060

### HANGERS AND SUPPORTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- C. Design seismic-restraint hangers and supports for piping and equipment.
- D. Design and obtain approval from authorities having jurisdiction for seismic-restraint hangers and supports for piping and equipment.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.
- B. Welding certificates.

##### 1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

#### PART 2 - PRODUCTS

##### 2.1 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.

##### 2.2 MANUFACTURED UNITS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.

1. Available Manufacturers:
  - a. AAA Technology and Specialties Co., Inc.
  - b. B-Line Systems, Inc.
  - c. Carpenter & Patterson, Inc.
  - d. Empire Tool & Manufacturing Co., Inc.
  - e. Globe Pipe Hanger Products, Inc.
  - f. Grinnell Corp.
  - g. GS Metals Corp.
  - h. Michigan Hanger Co., Inc.
  - i. National Pipe Hanger Corp.
  - j. PHD Manufacturing, Inc.
  - k. PHS Industries, Inc.
  - l. Piping Technology & Products, Inc.
2. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Available Manufacturers:
  - a. B-Line Systems, Inc.
  - b. Grinnell Corp.
  - c. GS Metals Corp.
  - d. Michigan Hanger Co., Inc.
  - e. National Pipe Hanger Corp.
  - f. Thomas & Betts Corp.
  - g. Unistrut Corp.
  - h. Wesanco, Inc.
2. Coatings: Galvanized, unless bare metal surfaces are indicated.
3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

## 2.3 MISCELLANEOUS MATERIALS

- A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- D. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
2. Properties: Nonstaining, noncorrosive, and nongaseous.
3. Design Mix: 5000-psi, 28-day compressive strength.

## **PART 3 - EXECUTION**

### **3.1 APPLICATIONS**

- A. Specific hanger requirements are specified in sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
  1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
  2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
  3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
  4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
  5. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30.
  6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
  7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
  8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
  1. Steel Turnbuckles (MSS Type 13): For adjustment up to 4 inches for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

- F. Building Attachments: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
    - b. Medium (MSS Type 32): 1500 lb.
    - c. Heavy (MSS Type 33): 3000 lb.
  8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
- H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
  2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
  3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.



## 3.2 INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- K. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.

- a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
  - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
  - c. Do not exceed pipe stress limits according to ASME B31.9.
- 2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.
    - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
  - 5. Pipes NPS 8 and Larger: Include wood inserts.
  - 6. Insert Material: Length at least as long as protective shield.
  - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.3 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.

### **3.4 METAL FABRICATION**

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.5 ADJUSTING**

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

### **3.6 PAINTING**

- A. Touching Up: 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. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils. See Division 9 Section 09960 "Coatings" for paint materials and application requirements.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

## SECTION 15140

### DOMESTIC WATER PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.
- B. Water system materials and components outside of buildings are described in Section 02510 – Water System.
- C. Accessories for the Water System are described in Section 02520 - Water System Accessories.
- D. Water system materials and components inside the water treatment plant building and within 5 feet of the building are described in Section 15052 – Process Piping.

##### 1.2 SUBMITTALS

- A. Water Samples: Specified in "Cleaning" Article in Part 3.
- B. Field quality-control test reports.

##### 1.3 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," and NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for combined fire-protection and domestic water service piping to building.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.
- D. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

#### PART 2 - PRODUCTS

##### 2.1 PIPING MATERIALS

- A. Transition Couplings: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
4. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Domestic Water Piping: Use any of the following piping materials for each size range:
  1. NPS 1-1/2 and Smaller: Hard copper tube, Type L Type M; copper pressure fittings; and soldered joints.
  2. NPS 2: Hard copper tube, Type L Type M; copper pressure fittings; and soldered joints.

### 3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
  2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
  3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
  4. Drain Duty: Hose-end drain valves.

### 3.3 PIPING INSTALLATION

- A. Refer to Division 2 Section 02510 "Water System" for site water distribution and service piping.
- B. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for basic piping installation.

- C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
- D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for wall penetration systems.
- F. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section 15430 "Plumbing Specialties" for drain valves and strainers.
- G. Install domestic water piping level without pitch and plumb.
- H. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- I. Perform the following steps before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
  - 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- J. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

### 3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.5 VALVE INSTALLATION

- A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

- B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Refer to Division 15 Section 15430 "Plumbing Specialties " for balancing valves.
- E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Division 15 Section 15430 "Plumbing Specialties" for calibrated balancing valves.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section 15060 "Hangers and Supports" for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section 15060 "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
  - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
  - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:

1. Booster Systems: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section 15410 "Plumbing Fixtures."
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.8 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.



B. Test domestic water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Fill and isolate system according to either of the following:
    - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
  - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
  - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

## SECTION 15145

### DOMESTIC WATER PIPING SPECIALTIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following domestic water piping specialties:
  - 1. Backflow preventers.
  - 2. Balancing valves.
  - 3. Temperature-actuated water mixing valves.
  - 4. Strainers.
  - 5. Hose bibbs.
  - 6. Wall hydrants.
  - 7. Drain valves.
  - 8. Trap-seal primer valves.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

##### 1.4 QUALITY ASSURANCE

- A. NSF Compliance:
  - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
  - 2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

#### PART 2 - PRODUCTS

##### 2.1 VACUUM BREAKERS

- A. Hose-Connection Vacuum Breakers:

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:
  - a. Arrowhead Brass Products, Inc.
  - b. Cash Acme.
  - c. Conbraco Industries, Inc.
  - d. Legend Valve.
  - e. MIFAB, Inc.
  - f. Prier Products, Inc.
  - g. Watts Industries, Inc.; Water Products Div.
  - h. Woodford Manufacturing Company.
  - i. Zurn Plumbing Products Group; Light Commercial Operation.
  - j. Zurn Plumbing Products Group; Wilkins Div.
  - k. <Insert manufacturer's name.>
2. Standard: ASSE 1001.
3. Body: Bronze, non-removable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

## 2.2 TEMPERATURE-ACTUATED WATER MIXING VALVES

### A. Water-Temperature Limiting Devices :

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. Armstrong International, Inc.
  - b. Cash Acme.
  - c. Conbraco Industries, Inc.
  - d. Honeywell Water Controls.
  - e. Legend Valve.
  - f. Leonard Valve Company.
  - g. Powers; a Watts Industries Co.
  - h. Symmons Industries, Inc.
  - i. Taco, Inc.
  - j. Watts Industries, Inc.; Water Products Div.
  - k. Zurn Plumbing Products Group; Wilkins Div.
  - l. <Insert manufacturer's name.>
3. Standard: ASSE 1017.
4. Pressure Rating: 125 psig.
5. Type: Thermostatically controlled water mixing valve.
6. Material: Bronze body with corrosion-resistant interior components.
7. Connections: Threaded inlets and outlet.

8. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
9. Tempered-Water Setting: 104 deg F.
10. Tempered-Water Design Flow Rate: 5 gpm.
11. Valve Finish: Rough bronze.

## **2.3 HOSE BIBBS**

### **A. Hose Bibbs :**

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Field-installation, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.

## **2.4 WALL HYDRANTS**

### **A. Vacuum Breaker Wall Hydrants :**

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. Arrowhead Brass Products, Inc.
  - b. Mansfield Plumbing Products LLC.
  - c. McDonald, A. Y. Mfg. Co.
  - d. Prier Products, Inc.
  - e. Smith, Jay. R. Mfg. Co.; Division of Smith Industries, Inc.
  - f. Watts Industries, Inc.; Water Products Div.
  - g. Woodford Manufacturing Company.
  - h. Zurn Plumbing Products Group; Light Commercial Operation.
3. Standard: ASSE 1019, Type A or Type B.
4. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
5. Classification: Type A, for automatic draining with hose removed.
6. Pressure Rating: 125 psig.

7. Operation: Loose key
8. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
9. Inlet: NPS 1/2 or NPS 3/4 (DN 15 or DN 20).
10. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

## **2.5 DRAIN VALVES**

### **A. Ball-Valve-Type, Hose-End Drain Valves :**

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

## **2.6 TRAP-SEAL PRIMER VALVES**

### **A. Supply-Type, Trap-Seal Primer Valves :**

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. MIFAB, Inc.
  - b. PPP Inc.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - e. Watts Industries, Inc.; Water Products Div.
3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig minimum.
5. Body: Bronze.
6. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
7. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
  - 1. Install thermometers and water regulators if specified.
  - 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
- C. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- D. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

### **3.2 ADJUSTING**

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

**END OF SECTION**

**SECTION 15150  
SANITARY WASTE AND VENT PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building.

**1.2 SUBMITTALS**

- A. Field quality-control test reports.

**1.3 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

**PART 2 - PRODUCTS**

**2.1 PIPING MATERIALS**

- A. Flexible Transition Couplings for Underground Non-pressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- B. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Hub-and-Spigot Cast-Iron Pipe and Fittings: ASTM A 74, Service class.
  - 1. Gaskets: ASTM C 564, rubber.
- D. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
  - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
    - a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
      - 1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
      - 2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.

- b. Compact, Stainless-Steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless-steel corrugated shield; stainless-steel bands; and sleeve.
    - 1) NPS 1-1/2 to NPS 4: 2-1/8-inch- wide shield with 2 bands.
    - 2) NPS 5 and NPS 6: 3-inch- wide shield with 4 bands.
    - 3) NPS 8 and NPS 10: 4-inch- wide shield with 4 bands.
    - 4) NPS 12 and NPS 15: 5-1/2-inch- wide shield with 6 bands.
- E. ABS Pipe: ASTM D 2661, Schedule 40, solid wall.
  - 1. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- F. Cellular-Core, ABS Pipe: ASTM F 628, Schedule 40.
  - 1. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- G. ABS Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.
- H. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
  - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
- I. Cellular-Core, Schedule 40, PVC Pipe: ASTM F 891, Schedule 40.
  - 1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- J. Cellular-Core, Sewer and Drain Series, PVC Pipe: ASTM F 891, Series PS 100.
  - 1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.
- K. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

## **PART 3 - EXECUTION**

### **3.1 PIPING APPLICATIONS**

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:



1. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301 304, stainless steel.
    - b. Couplings: Heavy-duty, FMG approved cast iron.
    - c. Couplings: Compact, stainless steel.
  2. NPS 1-1/4 and NPS 1-1/2: ABS pipe, ABS socket fittings, and solvent-cemented joints.
  3. NPS 1-1/4 and NPS 1-1/2: Cellular-core, ABS pipe; ABS socket fittings; and solvent-cemented joints.
  4. NPS 1-1/4 and NPS 1-1/2: PVC pipe, PVC socket fittings, and solvent-cemented joints.
  5. NPS 1-1/4 and NPS 1-1/2: Cellular-core, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
  6. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.
  7. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 304 stainless steel.
    - b. Couplings: Heavy-duty, FMG approved.
    - c. Couplings: Compact, stainless steel.
  8. NPS 2 to NPS 4: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
  9. NPS 2 to NPS 4: Stainless-steel piping, gaskets, and gasketed joints.
  10. NPS 2 to NPS 4: Copper DWV tube, copper drainage fittings, and soldered joints.
  11. NPS 2 to NPS 4: ABS pipe, ABS socket fittings, and solvent-cemented joints.
  12. NPS 2 to NPS 4: Cellular-core, ABS pipe; ABS socket fittings; and solvent-cemented joints.
  13. NPS 2 to NPS 4: PVC pipe, PVC socket fittings, and solvent-cemented joints.
  14. NPS 2 to NPS 4: Cellular-core, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
- D. Underground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
1. NPS 1-1/2: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301 304, stainless steel.
    - b. Couplings: Heavy-duty, FMG approved cast iron.
    - c. Couplings: Compact, stainless steel.
  2. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.
  3. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
    - a. Couplings: Heavy-duty, Type 301 304, stainless steel.
    - b. Couplings: Heavy-duty, FMG approved cast iron.
    - c. Couplings: Compact, stainless steel.

### 3.2 PIPING INSTALLATION

- A. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for basic piping installation.
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for wall penetration systems.
- E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.
- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- I. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- J. Install ABS soil and waste drainage and vent piping according to ASTM D 2661.

- K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### **3.3 JOINT CONSTRUCTION**

- A. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
  - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

### **3.4 HANGER AND SUPPORT INSTALLATION**

- A. Refer to Division 15 Section 15060 "Hangers and Supports" for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section 15060 "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  - 4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- F. Install supports for vertical cast-iron soil piping every 15 feet.

- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
  - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
  - 3. NPS 2: 10 feet with 3/8-inch rod.
  - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
  - 5. NPS 3: 12 feet with 1/2-inch rod.
  - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
- H. Install supports for vertical steel piping every 15 feet.
- I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
  - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
  - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
- J. Install supports for vertical copper tubing every 10 feet.
- K. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
  - 2. NPS 3: 48 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
- L. Install supports for vertical ABS and PVC piping every 48 inches.
- M. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### **3.5 CONNECTIONS**

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section 15410 "Plumbing Fixtures."
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section 15430 "Plumbing Specialties."

4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

### **3.6 FIELD QUALITY CONTROL**

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
  1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  2. Prepare reports for tests and required corrective action.

### **3.7 CLEANING**

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### **3.8 PROTECTION**

- A. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

**END OF SECTION**

## SECTION 15155

### SANITARY WASTE PIPING SPECIALTIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
  - 1. Cleanouts.
  - 2. Floor drains.
  - 3. Roof flashing assemblies.
  - 4. Miscellaneous sanitary drainage piping specialties.
  - 5. Flashing materials.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

##### 1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

#### PART 2 - PRODUCTS

##### 2.1 BACKWATER VALVES

##### 2.2 CLEANOUTS

- A. Exposed Cast-Iron Cleanouts:
  - 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:
    - a. Josam Company; Josam Div.
    - b. MIFAB, Inc.
    - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - d. Tyler Pipe; Wade Div.
    - e. Watts Drainage Products Inc.
    - f. Zurn Plumbing Products Group; Specification Drainage Operation.
  - 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

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:
  - a. Josam Company; Josam Div.
  - b. Oatey.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - e. Tyler Pipe; Wade Div.
  - f. Watts Drainage Products Inc.
  - g. Zurn Plumbing Products Group; Light Commercial Operation.
  - h. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrule .
3. Size: Same as connected branch.
4. Body or Ferrule: Cast iron
5. Clamping Device: Required.
6. Outlet Connection: Spigot
7. Closure: Brass plug with straight threads and gasket.
8. Adjustable Housing Material: Cast iron with threads set-screws or other device.
9. Frame and Cover Material and Finish Rough bronze >.
10. Top Loading Classification: Heavy Duty.
11. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

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:
  - a. Josam Company; Josam Div.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - d. Tyler Pipe; Wade Div.
  - e. Watts Drainage Products Inc.
  - f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.

5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, cover plate with screw.
8. Wall Access: wall-installation frame and cover.

## **2.3 FLOOR DRAINS**

### **A. Cast-Iron Floor Drains:**

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:
  - a. Commercial Enameling Co.
  - b. Josam Company; Josam Div.
  - c. MIFAB, Inc.
  - d. Prier Products, Inc.
  - e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - f. Tyler Pipe; Wade Div.
  - g. Watts Drainage Products Inc.
  - h. Zurn Plumbing Products Group; Light Commercial Operation.
  - i. Zurn Plumbing Products Group; Specification Drainage Operation.
  - j.
2. Standard: ASME A112.6.3
3. Pattern Floor drain.
4. Body Material: Gray iron
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Side.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required
11. Sediment Bucket: <Insert description>.
12. Top or Strainer Material: Bronze
13. Top of Body and Strainer Finish: Rough bronze
14. Dimensions of Top or Strainer: 4 inches.
15. Funnel: Not required.
16. Inlet Fitting: Not required
17. Trap Material Cast iron
18. Trap Pattern: Standard P-trap

## **2.4 ROOF FLASHING ASSEMBLIES**

### **A. Roof Flashing Assemblies:**



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:
  - a. Acorn Engineering Company; Elmdor/Stoneman Div.
  - b. Thaler Metal Industries Ltd.
- B. Description: Manufactured assembly made of 0.0625-inch thick, flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
  1. Open-Top Vent Cap: Without cap.

## **2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES**

### **2.6 FLASHING MATERIALS**

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
  1. General Use: 4.0-lb/sq. ft.
  2. Vent Pipe Flashing: 3.0-lb/sq. ft. thickness.
  3. Burning: 6-lb/sq. ft. thickness.
- B. Fasteners: Metal compatible with material and substrate being fastened.
- C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- D. Solder: ASTM B 32, lead-free alloy.
- E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Refer to Division 15 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  1. Size same as drainage piping up to NPS 4 Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
  2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    - a. Radius, 30 Inches for Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
  3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Assemble open drain fittings and install with top of hub 1 inch above floor.
- I. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
  2. Size: Same as floor drain inlet.
- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.
- N. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
  2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
  3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
  4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
- O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

### **3.2 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

### **3.3 FLASHING INSTALLATION**

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches and skirt or flange extending at least 8 inches around pipe.
  2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
  3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

### **3.4 LABELING AND IDENTIFYING**

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Identification for Plumbing Piping and Equipment."

### **3.5 PROTECTION**

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**END OF SECTION**

## **SECTION 15300**

### **CHLORINATION STATION**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION**

- A. The work of this section consists of constructing and installing chlorination equipment and all appurtenances.

##### **1.2 SUBMITTALS**

- A. In accordance with Section 01330.

##### **1.3 RELATED WORK SPECIFIED ELSEWHERE**

- A. Cast-In-Place Concrete – Section 03300
- B. Earthwork – Section 02300
- C. Electrical – Section 16010

#### **PART 2 - PRODUCTS**

##### **2.1 CHLORINATION EQUIPMENT**

- A. Solution Metering Pump:
  - 1. Chemical feed pump shall be positive displacement, hydraulic diaphragm type constructed of material suitable for handling a chlorine solution. Chemical feed pump shall have a feed rate of 0.75 gph and shall be LMI Model #AA781, or approved equal.
  - 2. Chemical pump shall be equipped with manual stroke adjusting mechanism.
  - 3. Pump shall be furnished complete with 4-function valve which shall provide: 1) diaphragm type anti-siphon protection, 2) back pressure, 3) priming aid/line drain, and 4) pressure relief) and shall be suitable for wall mounting
- B. Chemical Solution Tank:
  - 1. Chemical tank shall be constructed of polyethylene with a capacity of approximately 10 gallons.
  - 2. The tank shall be furnished with a cover and cap as appropriate. Chemical tank and appurtenances shall be LMI or approved equal.

- C. Pressure Piping: 1/4" PVC tubing.
- D. Suction Piping: As recommended by system Manufacturer.
- E. Chemicals: Provide three (3) one-gallon containers of 12.5% hypochlorite solution at end of work.

## 2.2 INJECTION POINT

- A. Provide tee in water treatment plan plumbing for injection of chlorine solution as shown. Provide suitable adapters for connection of PVC tubing to PVC Schedule 80 tee. Provide shutoff valve to allow servicing of chlorination equipment without shutting down water system.

## 2.3 CALIBRATION CYLINDER

- A. 200 ml clear plastic.
- B. Markings in millimeters and gallons per hour.
- C. Vented top.
- D. LMI calibration cylinder or equal.

## PART 3 - EXECUTION

### 3.1 CHLORINATION EQUIPMENT

- A. All chlorination equipment to be installed as shown on plans, including one time fill of chemical feed tank.
- B. Chemical feed system to be tested to ensure all components are operating correctly.

### 3.2 PIPING

- A. As per Section 15052 – Process Piping.

**END OF SECTION**

**SECTION 15469**  
**WATER SOFTENERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes water softeners and accessories for water-supply systems.

**1.2 SUBMITTALS**

- A. Product Data: Include rated capacities, ion-exchange resins, salt purity and form, furnished specialties, and accessories for each unit indicated.
- B. Shop Drawings: Include detailed equipment layouts and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Manufacturer's field service reports.
- D. Operation and maintenance data.
- E. Warranties.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**1.4 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. Salt for Brine Tanks: Furnish at least four times original load, but not less than 100 lb. Deliver on pallets according to the following:
    - a. Pellet Form: In 40- or 50-lb packages.
    - b. Solar-Salt Form: In 40- or 50-lb packages.
  - 2. Store salt on raised platform where directed by Owner. Do not store in contact with concrete floor.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which Manufacturer agrees to repair or replace components of water softeners that fail in materials or workmanship within three years from date of Substantial Completion. Include coverage for the following:
1. Attrition loss of resin not to exceed 3 percent per year.
  2. Resin not to be washed out of system during service run or backwashing period.
  3. Effluent turbidity not to be greater and color not to be darker than incoming water.
  4. Underdrain system, gravel, and resin not to become fouled, with turbidity or by dirt, rust, or scale from softener equipment or soft water, while operating according to Manufacturer's written operating instructions.

## PART 2 - PRODUCTS

### 2.1 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 Work include, but are not limited to, Manufacturers specified.
  2. Manufacturers: Subject to compliance with requirements, provide products by Manufacturers specified.

### 2.2 HOUSEHOLD WATER SOFTENERS

- A. Description: Factory-assembled, pressure-type, household or commercial water softener suitable for household applications.
1. Available Manufacturers:
    - a. Powerline Model PS1054
    - b. Or approved equal.
  2. Configuration: Single unit with one softener tank and one brine tank.
  3. Softener Tank: Steel or FRP, with coating or liner suitable for potable-water service and 100-psig minimum pressure rating.
  4. NSF Compliance: NSF 61, "Drinking Water System Components--Health Effects."
  5. Controls: For automatic or fully automatic operation.
  6. Brine Tank: Combination brine and brine measuring. Include single wet-salt storage section.
    - a. Construction: Fabricated from FRP or molded PE. Include plastic cover.
    - b. Brine Valve: Float operated and plastic fitted for automatic control of brine withdrawn and freshwater refill. Include brine tubing and fittings.
    - c. Size: Sufficient for at least two regenerations at full salting.



7. Controls: Factory mounted on units and factory-wired cycle controls. Include the following:
  - a. Adjustable duration of various regeneration steps.
  - b. Push-button start and complete manual operation.
  - c. Electric time clock and switch for fully automatic operation, adjustable to initiate regeneration at any hour of day and any day of week or at fixed intervals.
  - d. Sequence of Operation: Program multiport pilot-control valve to automatically pressure actuate main operating valve through steps of regeneration and return to service. Include pointer on pilot-control valve to indicate cycle of operation and means of manual operation of pilot-control valve if power fails.
  - e. Main Operating Valves: Industrial, automatic, multiport, diaphragm type with the following features:
    - 1) Slow opening and closing, nonslam operation.
    - 2) Diaphragm guiding on full perimeter from fully open to fully closed.
    - 3) Isolated dissimilar metals within valve.
    - 4) Self-adjusting, internal, automatic brine injector that will draw brine and rinse at constant rate independent of pressure.
    - 5) Valve for single unit with internal automatic bypass of raw water during regeneration.
    - 6) Sampling cocks for soft water.
    - 7) Special tools are not required for service.
  - f. Flow Control: Automatic, to control backwash and flush rates over wide variations in operating pressures, and that does not require field adjustments.
    - 1) Demand-Initiated Control: Equip softener-tank unit with automatic-reset-head water meter that will electrically activate cycle controller to initiate regeneration at preset total in gallons. Design so head will automatically reset to preset total in gallons for next service run.
- B. Ion-Exchange Resin: High-capacity, sulfonated polystyrene that is stable over entire pH range with good resistance to bead fracture from attrition or shock. Include capacity to 45,000 grains of calcium carbonate hardness/cu. ft. of resin when regenerated with 22.5 lb of salt.
- C. Salt for Brine-Tank Applications: High-purity, sodium chloride that is free of dirt and foreign material. Rock and granulated forms are unacceptable.
- D. Water-Hardness Testing Set: Manufacturer's standard testing apparatus and chemicals with testing procedure instructions and metal container suitable for wall mounting.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install water softener equipment on concrete bases, level and plumb. Maintain Manufacturer's recommended clearances. Arrange units so controls and devices needing servicing are accessible.
- B. Anchor tanks and floor-mounting accessories to substrate.
- C. Install pressure gages on raw-water inlet and soft-water outlet piping of each water softener tank. Refer to Division 15 Section 15122 "Meters and Gages" for pressure gages.
- D. Install water testing sets near each water softener.

### **3.2 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Make piping connections to dissimilar-metal water piping with dielectric fittings. Refer to Division 15 Section 15050 "Basic Mechanical Materials and Methods" for dielectric fittings.
- D. Install drains as indirect wastes to spill into open drains or over floor drains.
- E. Install brine lines and fittings furnished by Manufacturer but not specified to be factory mounted.
- F. Install electrical connections for power, controls, and devices. Electrical power wiring, devices, and connections are specified in Division 16 Sections.

### **3.3 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field assembly of components and installation of water softeners, including piping and electrical connections; perform startup service; and train Owner's operating personnel. Report results in writing.
  - 1. Leak Tests: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water softeners. Provide at least 2 hours of training.

**END OF SECTION**

**SECTION 15485**  
**HOT WATER HEATERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the hot water heater and accessories.

**1.2 SUBMITTALS**

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

**PART 2 - PRODUCTS**

**2.1 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.

## 2.2 WATER HEATERS

### A. Water Heaters: Comply with ANSI Z21.10.3/CSA 4.3.

#### 1. Available Manufacturers:

- a. American Water Heater Company.
- b. Bock Water Heaters, Inc.
- c. Bradford White Corporation.
- d. GSW Water Heating Company.
- e. HESco Industries, Inc.
- f. Lochinvar Corporation.
- g. PVI Industries, LLC.
- h. Rheem Water Heater Div.; Rheem Manufacturing Company.
- i. Ruud Water Heater Div.; Rheem Manufacturing Company.
- j. Smith, A. O. Water Products Company.
- k. State Industries, Inc.

#### 2. Storage-Tank Construction: Non-ASME-code steel with 150-psig working-pressure rating.

- a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
  - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
  - 2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
- b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

#### 3. Factory-Installed, Storage-Tank Appurtenances:

- a. Anode Rod: Replaceable magnesium.
- b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
- c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
- d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
- e. Jacket: Steel with enameled finish.
- f. Burner: For use with atmospheric water heaters and for LP-gas fuel.
- g. Automatic Ignition: ANSI Z21.20, electric, automatic, gas-ignition system.
- h. Temperature Control: Adjustable thermostat.
- i. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
- j. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction.
5. Draft Hood: Draft diverter; complying with ANSI Z21.12.

B. Capacity and Characteristics:

1. Capacity: 50 gallon min
2. Recovery: 70 degree F temperature rise.
3. Temperature Setting: 125 deg F (52 deg C).
4. Electrical Characteristics:
  - a. Volts: 120 240 .
  - b. Phase: Single Three.
  - c. Hertz: 60.
  - d. Full-Load Amperes:
  - e. Minimum Circuit Ampacity:
  - f. Maximum Overcurrent Protection:
5. Minimum Vent Diameter:

### **2.3 WATER HEATER ACCESSORIES**

- A. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

## **PART 3 - EXECUTION**

### **3.1 WATER HEATER INSTALLATION**

- A. Install water heaters on concrete bases.
  1. Concrete base construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for hose-end drain valves.

- E. Install thermometer on outlet piping of water heaters.
- F. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- G. Fill water heaters with water.

### **3.2 CONNECTIONS**

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- B. Ground equipment according to Division 16 Specifications.
- C. Connect wiring according to Division 16 Specifications.

### **3.3 FIELD QUALITY CONTROL**

- A. Engage a factory-authorized service representative to inspect installation, including connections.
- B. Perform the following field tests and inspections:
  - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

**END OF SECTION**

## SECTION 15735

### ROOM AIR CONDITIONERS

#### PART 1 - GENERAL

##### 1.1 Work Included

- A. This section includes materials, testing, and installation room air conditioners (packaged terminal air conditioners).
- B. Air conditioning equipment specified herein shall be ENERGY STAR Rated,
- C. Section 5.508 of the California Green Building Standards (CALGreen) Code prohibits use of chlorofluorocarbons (CFD's) and Halons as refrigerants.

##### 1.2 Related Work

- A. Section 01300: Submittal Procedures
- B. Section 01400: Quality Requirements
- C. Section 01610: Product Requirements
- D. Section 01650: Product Delivery, Storage and Handling Requirements
- E. Section 01700: Execution Requirements
- F. Section 01783: Operating and Maintenance Data
- G. Section 02050: Basic Civil Engineering Requirements
- H. Section 09900: Paints and Coatings
- I. Section 13427: Temperature Instruments
- J. Section 15700: HVAC Equipment
- K. Section 15790: HVAC Equipment Vibration Isolation

##### 1.3 System Description

- A. Furnish and install complete operating room air conditioners including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.
- B. Room air conditioner control system input control variables shall include the following:
- C. Air conditioning normal start sequence shall trigger a timed circuit to turn equipment on when either of the following conditions occur
  - a. Cooling mode: the thermostat temperature exceeds a preset maximum.
  - b. Heating mode: the thermostat temperature drops below a preset minimum.
- D. Heating, ventilation and air conditioning normal shut down sequence shall shut down equipment when all of the following conditions occur:
  - a. Cooling mode: the thermostat temperature drops below a preset minimum.
  - b. Heating mode: the thermostat temperature exceeds a preset maximum.
  - c.



**1.4 Quality Assurance**

A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

B. Factory testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Roof- and Wall- Mount HVAC Units	Operation		1 test each unit	Contractor	Contractor
	ASHRAE 90 Certification	ASHRAE 90a	Certify units have been tested and rated to exceed minimum operating efficiencies defined as Coefficient of Performance (COP) and Energy Efficiency Ratio (EER) specified herein and n ASHRAE 90a Chapter 6	Contractor	Contractor

C. Factory testing shall demonstrate and certify compliance with California Energy Code Section 112, Table 112E including the following performance requirements:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Room Air Conditioners (Package Terminal Air Conditioners)	Energy Efficiency Ratio	ARI 310/380 and California Energy Code Section 112 12.5 minimum EER for new equipment	All units	Contractor	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor

D. Factory testing shall demonstrate and certify compliance with California Energy Code Section 112, including the following performance requirements:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Room Heat Pumps (Package Terminal Heat Pumps)	Energy Efficiency Ratio Cooling Mode	ARI 310/380 and California Energy Code Section 112 12.3 minimum EER for new equipment	All units	Contractor	Contractor
	Energy Efficiency Ratio Heating Mode	ARI 310/380 and California Energy Code Section 112 3.2 minimum COP for new equipment	All units	Contractor	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor

- E. Where equipment is required to be ENERGY STAR rated, the stricter premium efficiencies required for ENERGY STAR rating shall govern over requirements above.

**1.5 References**

- A. AMCA 210 Laboratory Methods of Testing Fans for Rating
- B. AMCA 300 Reverberant Room Method for Sound Testing of Fans
- C. AMCA 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data
- D. AMCA 302 Application of Sone Ratings for Non-Ducted Air Moving Devices
- E. ARI 310/380 Packaged Terminal Air Conditioners and Heat Pumps
- F. California Energy Code (CEnC)
- G. California Green Building Standards Code (CALGreen Code)
- H. California Mechanical Code (CMC)
- I. NEMA/ANSI 250 Enclosures for Electrical Equipment
- J. NFPA 70 National Electric Code (NEC)
- K. NFPA 90A Installation of Air Conditioning and Ventilating Systems
- L. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems

**1.6 Submittals**

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for electrically powered equipment under electrically powered equipment shop drawing requirements.	.
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation or application instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements.	
Test Record Transcripts	Submit for factory tests per test record transcript requirements.	
Motor Data	Required per motor data requirements of Section 01330.	
Warranty	Furnish three-year warranty from date of final acceptance	

- B. Refer to Section 01330 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, and test record transcripts.

**1.7 Delivery, Storage and Handling**

- A. Deliver motorized equipment as a factory assembled unit to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units as required for moving to final location according to Manufacturer’s written instructions.
- C. Lift and support units with Manufacturer’s designated lifting or supporting points.
- D. Manufacturer’s instruction and warranty requirements for delivery, storage and handling of heating, ventilation and air conditioning equipment shall be strictly followed.

**PART 2 - PRODUCTS**

**2.1 Acceptable Manufacturers**

- A. Acceptable Manufacturers include the following:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Air Filters	American Air Filter Farr 30/30 Class 2	Plymouth, MN

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Camfil Farr 30/30 Class 2	Riverdale, NJ
	Tri-Dim Filter Corporation "Tridek"	City of Industry, CA
	Accepted equal	
Room Air Conditioner	Amana Refrigeration, Inc.	Amana, IA
	American Air Filter	Plymouth, MN
	Carrier Corp	Farmington, CT
	Friedrich Air Conditioning Company	San Antonio, TX
	Goodman Manufacturing Co	Houston, TX
	Heat Controller, Inc	Jackson, MI
	Lennox Industries	Dallas, TX
	McQuay International	Plymouth, MN
	Sanyo Fisher Co	Chatsworth, CA
	Trane Company	LaCrosse, WI
	York International Corp	York, PA
Accepted equal		

- A. Equipment furnished shall operate through its full operating range powered by amperages specified or shown on Plans. Equipment requiring a larger amperage than specified or shown is unacceptable in absence of written statement from Owner the electrical infrastructure and switchgear can support the increased amperage.
- B. Electrical components, devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to local building code authorities. Electrical components, devices and accessories shall be marked for the use intended.
- C. Air movement and control products shall comply with performance requirements and shall be labeled with and licensed to use the AMCA Certified Ratings Seal.

## 2.2 **Materials**

- A. Refer to Section 01610 / 02050 for basic requirements for products and materials.
- B. Comply with California Energy Code Standards.
- C. For air conditioning equipment list see Air Conditioner Schedule on plans.
- D. For air conditioning design data, see Air Conditioning Design Data schedule on plans.
- E. Enclosures and curbs shall be weatherproof and constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Frame	Welded steel	14 gauge minimum
	Stainless steel	14 gauge minimum
Panels and Doors	Galvanized steel	14-gauge or 16-gauge
	Stainless steel	14-gauge or 16-gauge
Air Filter Holding Frame	Galvanized steel	With gaskets and spring sealing fasteners
	Stainless steel	With gaskets and spring sealing fasteners
Insulation in Cooling Section and Compressor Section	Coated glass fiber	1-inch thick 1-lb density / 1-inch thick 1½-lb density
Nameplate	Stainless Steel	16 gauge
Finish	Phosphatized and finish painted	

- F. The following product design criteria, options and accessories are required for air filters:

ITEM	DESCRIPTION	
Air Filters	Minimum Efficiency Reporting	8

ITEM	DESCRIPTION	
	Value (MERV)	
	UL Listing	Class 2
	Thickness	1 inch
	Construction	Disposable
		Strainer type
		With pleated nonwoven fabric filters
	Rated Efficiency	30%
Average Arrestance	90% in accordance with ASHRAE 52-2	
Holding Frames	With gaskets and spring sealing fasteners	

- G. The following product design criteria, options and accessories are required for room air conditioner units:

ITEM	DESCRIPTION
Air Conditioner	Refrigerant cooling coil package unit containing compressor, condenser coil and condenser fan.
Equipment Identification Plates	Secure to each equipment component in visible location.
	Plate shall bear 3/8"-high engraved black-enamel-filled block equipment identification number and letters shown herein.
Drain Pan	ABS
Filter Duct Collar Back	Required
Access Doors and Panels	Provide full access to internal components without dismantling entire unit.
Motor	G3 with tap-wound permanent split capacitor
Valve	Two-way motorized

- H. The following electrical design criteria are required for equipment specified in this section:

ITEM	DESCRIPTION	
Electrical Work	NEC Article 505 Classification	Nonhazardous
Enclosures	NEMA 250 Enclosure Rating	NEMA 3 – Dust tight, Rain tight NEMA 3R – Rainproof, Sleet-Resistant
Control Panel Mounting	Local Mount	Unit-mount
Power Supply	Motor Circuit	230VAC – 1 phase – 60Hz
	Heating Circuit	230VAC – 1 phase – 60Hz

## PART 3 - EXECUTION

### 3.1 Preparation

- A. Make field measurements needed to install room air conditioners before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Coordinate size and location of structural steel support members.
- C. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.
- D. Provide flashing including base flashing and counter flashing where items of this section penetrate the roof, outer walls or waterproofing of any kind.

### **3.2 Installation**

- A. Refer to Section 01700 / 02050 for basic execution and installation requirements.
- B. Install room air conditioners to allow maximum possible headroom unless specific mounting heights are shown.
- C. Install equipment to facilitate service, maintenance and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- E. The following installation standards shall be followed:
  - 1. Manufacturer's installation and warranty requirements
  - 2. Applicable OSHA and Cal OSHA regulations
  - 3. California Mechanical Code Chapter 11 "Refrigeration"
  - 4. Other applicable building, fire, plumbing, mechanical and electrical code requirements
  - 5. NFPA 70 National Electric Code (NEC) Article 430 "Air Conditioning and Refrigeration Equipment"
  - 6. NFPA 90A Installation of Air Conditioning and Ventilating Systems
  - 7. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems
- D. Refer variances between the above documents and Contract Documents to Owner's Representative.
- E. Install room air conditioners to tolerances recommended by Manufacturer. Unless otherwise shown, install heating, ventilation and air conditioning true and level using precision gauges and levels.
- F. Cut fit and place miscellaneous mechanical supports accurately in location, alignment and elevation to support and anchor HVAC materials and equipment.
- G. Install room air conditioners level and plumb with clearances for service and maintenance. Provide seismic restraint as required by UBC.
- H. Align motors, bases, shafts, pulleys and belts of motor driven equipment. Tension belts according to Manufacturer's installation instructions.
- I. After completing installation, internally clean fans according to Manufacturer's instructions. Remove foreign material and construction debris. Vacuum fan wheels and cabinets. Inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finishes.
- J. Upon project completion, HVAC equipment shall receive full operating charges of refrigerant and oil.

### **3.3 Field Quality Control**

- A. Field testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Room Air Conditioners	Startup Checks	Verify shipping blocking & bracing are removed. Verify unit is securely mounted and that connections to accessories are complete. Verify thermal overload protection is installed on motors. Verify cleaning & adjusting are complete With fan drive disconnected, verify proper motor rotation and fan free wheel rotation and bearing operation. Reconnect fan drive system. Align & adjust belts. Install belt guards.	All fans	Contractor	Contractor
	Starting Procedures	Energize motor & adjust fan to indicated rpm. Measure & record motor voltage & amperage. After energizing electrical circuitry, start units to confirm proper motor rotation and unit operation. Test and adjust controls and safeties. Shut unit down and reconnect automatic temperature control operators. Adjust belt tension. Lubricate bearings.	All fans	Contractor	Contractor
	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

### 3.4 Spare Parts

A. Furnish the following spare parts:

QUANTITY	PART
1	Set filters to be installed by Contractor after testing and balancing
3	Sets replacement filters

**END OF SECTION**

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## SECTION 15838

### POWER VENTILATORS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. This Section includes the following:

1. Centrifugal wall ventilators.

##### 1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, and method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Operation and maintenance data.

##### 1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.



## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraphs 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.

### **2.2 CENTRIFUGAL WALL VENTILATORS**

- A. Description: Belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.
1. Available Manufacturers:
    - a. Acme Engineering & Mfg. Corp.
    - b. Aerovent; a Twin City Fan Company.
    - c. Ammerman Company, Inc. /General Resource Corp.
    - d. Breidert Air Products, Inc.
    - e. Broan Mfg. Co., Inc.
    - f. Carnes Company HVAC.
    - g. Chelsea Fans & Blowers, Inc.
    - h. Cook, Loren Company.
    - i. Dayton Electric Manufacturing Co.
    - j. Greenheck Fan Corp.
    - k. Hartzell Fan, Inc.
    - l. ILG Industries, Inc. /American Coolair Corp.
    - m. JennFan; Div. of Breidert Air Products, Inc.
    - n. NuTone Inc.
    - o. Penn Ventilation Companies, Inc.
  - B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.
  - C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.
  - D. Accessories:
    1. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
    2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
    3. Wall Grille: Ring type for flush mounting.
    4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.

### **2.3 MOTORS**

- A. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.
- B. Enclosure Type: Open drip proof.

### **PART 3 - INSTALLATION**

#### **3.1 FIELD QUALITY CONTROL**

- A. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Shut unit down and reconnect automatic temperature-control operators.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

**END OF SECTION**

**SECTION 16010**  
**ELECTRICAL**

**PART 1 – GENERAL**

**1.1 SCOPE OF WORK**

- A. The Contractor shall install, ready for use, the electrical system as specified herein and shown on the Contract drawings. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter. The “Owner” in Section 16010 & 16605 shall be defined as the “Engineer”
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals and services to provide a complete and operational electrical system as shown on the E-Series Contract Drawings, included in these Specifications, or necessary for fully operating facility. See Appendix “B” for “Device Index” for this project.
- C. Examine the specification and Drawings for mechanical equipment and provide all circuit breakers, switches, pushbuttons and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.
- D. It is recommended that the Electrical Contractor attend the job walk for the site and shall have accomplished the following:
  - 1. Thoroughly examine existing conditions before submitting his bid proposal to perform any work. He shall compare site conditions with data given on the plans or in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to have examined the site or to have failed to report any discrepancies to the Owner prior to bid.
  - 2. It is the Contractor’s responsibility to be fully familiar with the existing utility locations, conditions and local requirements and regulations.
  - 3. Verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between Work shown on the Drawings and measurements at the site.
- E. Any major deviations in location and conduit routing that the Contractor makes without the express written review or direction of the Engineer, shall be considered to have been made at the Contractor’s sole responsibility. Such

deviations made by the Contractor shall be reflected on the Contractor supplied "Record Drawings." The Owner will reimburse the Engineer and the Owner will then deduct an amount equal to said reimbursement from the Contractor's contract for all engineering, drafting, and clerical expenses associated with updating the Record Drawings due to any major unauthorized changes.

- F. The major areas in the scope of work as illustrated on E-series Contract drawings and Device Index located in Appendix "B", which includes both the furnishing and installation are:
1. Meter/Main
  2. Control Panels and associated hardware.
  3. Panelboards.
  4. Solar Power System.
  5. Conduits and the field interconnection wiring between the Control Panels, panelboards, solar power system, instrumentation, etc. and equipment provided under all other Divisions.
  6. Provide all necessary conduits, junction boxes, pullboxes, grounding system, field interconnection wiring, hardware, fittings, and devices to connect the designated equipment and wiring.
  7. All necessary miscellaneous shut off, sample, and calibration valves to sensors.
  8. Provide trenching, backfilling, and compaction for all underground conduit routes, concrete pads, and pull boxes.
  9. Grounding system and equipment grounding.
  10. Concrete pads and supports for electrical, solar and instrumentation equipment.
  11. Remove and dispose of all excess dirt, paving, concrete, and other materials from site work.
  12. Coordination of utility services.
- G. Existing site is limited in space. It is the Contractor's responsibility to provide an electrical and instrumentation package to fit in the allocated space.
- H. The following specifications incorporate specific equipment and devices that are preferred by the Owner because of their serviceability, to match existing equipment, because of the local availability of labor, parts and materials, or because of the ability of the Owner to umbrella the equipment under existing maintenance contracts.

- I. All electrical work shall conform with the National Electric Code (NEC) 2011 issue. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.
- J. All panels, panelboards, panelboard transformers, control hardware, etc. shall be supplied by one System Supplier. All panels and instrumentation listed in Division 16 Appendix B-Device Index shall be supplied by the same System Supplier. This includes, but is not limited to all work necessary to select, furnish, supervise installation, calibrate, program, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein.

## 1.2 CODES AND STANDARDS

- A. All electrical/instrumentation equipment and materials, including installation and testing, shall conform to the following applicable codes and standards:
  - 1. ANSI - American National Standards Institute, Inc.
  - 2. EIA - Electronics Industries Association.
  - 3. ETL - Electrical Testing Laboratories.
  - 4. FM - Factory Mutual.
  - 5. GO128 - General Order No. 128, Rules for Construction of Underground Electrical Supply and Communication Systems, Public Utilities Commission of the State of California.
  - 6. IEEE - Institute of Electrical and Electronics Engineers.
  - 7. ICEA - Insulated Power Cable Engineers' Association.
  - 8. ISA - International Society of Automation (ISA) Standards (formerly Instrument Society of America).
  - 9. NEC - National Electrical Code, 2011 Edition.
  - 10. NEMA - National Electrical Manufacturers Association.
  - 11. NETA - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association.
  - 12. NESC - National Electrical Safety Code.
  - 13. NFPA - National Fire Protection Agency & NFPA820
  - 14. OSHA - Occupational Safety and Health Act Standards.
  - 15. UL - Underwriter's Laboratories, Inc.
- B. The revisions of these codes and standards in effect on the date of issuance of the Contract Documents shall apply.
- C. Codes and standards referenced shall be considered minimum acceptable work.
- D. In instances where two or more codes are at variance, the most restrictive requirements shall apply.
- E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to the preceding codes and standards.

- F. All work shall also be performed in accordance with the Owner, State, County or Owner standards, and local Utility codes.
- G. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these codes and standards, even though the work is not explicitly mentioned in the Specifications or shown on the Contract E- Series Drawings.
- H. Amperage listed on the single-line Drawings for motors are per NEC Table 430.250 and may not necessarily match that of the equipment supplied. It is the electrical system supplier and Contractor's responsibility to furnish equipment sized for the motors supplied for this project at no additional cost.
- I. The Solar Power Contractor shall have extensive experience in providing and installing Solar Power systems of this size and complexity. The Contractor shall have a valid C-46 Solar Contractor license in the State of California and have a full-time experienced staff to provide and install systems. The Solar power system shall meet the requirements of NFPA 70, Article 690.

### 1.3 RELATED WORK IN OTHER SECTIONS

- A. Provide an electrical system that interfaces to work performed under other Mechanical and Equipment Sections of these Specifications.
- B. The following is part of Division 16:
  - 1. Section 16605 – Electrical Systems Analysis.

### 1.4 ELECTRICAL CONTRACTOR QUALIFICATIONS

- A. It is the intent of this Division that the complete responsibility for management and installation of the electrical and instrumentation required for this project be by a qualified Electrical Contractor. This responsibility includes, but not limited to, supervision and coordination of work performed by all suppliers of Division 16.
- B. Uncertified electricians shall not perform electrical work for which certification is required per Labor Code Section 3099. Electricians shall be required to carry proof of certification on their person at all times. Electricians found on the jobsite without proof of certification will be asked to leave, prohibited from working on-site until proof of certification has been provided and may be reported to the Contractors State License Board (CSLB).
- C. Contractor shall submit the proposed Electrical Subcontractor and System Supplier with bid documents that will be used on this project.
- D. If the Contractor, Electrical Subcontractor, and System Supplier listed in bid documents are deemed not qualified by Owner, they will have their bid rejected at the Owner's sole discretion and the next qualified bidder selected.

- E. The Electrical Subcontractor shall meet the following minimum qualifications:
1. Has a current C-10 Electrical Subcontractor's License.
  2. Has regularly engaged in similar electrical contracting for the Municipal Water and Wastewater Industry.
  3. Has successfully performed work of similar or greater complexity on at least two previous projects under one company name and under the present company name.
  4. Has all persons performing work as electricians certified by the California Apprenticeship Council per California Labor Code Section 3099.
  5. Has been actively engaged in the type of electrical and instrumentation work specified in this Division for a minimum of two years.
- F. Bid package shall include a list of five (5) completed projects of similar size and nature for water or wastewater treatment plants the Electrical Contractor has completed:
1. Provide completion dates of projects.
  2. References of Owner Representative in charge of project, including contact name and telephone number.

## 1.5 SYSTEM SUPPLIER QUALIFICATIONS

- A. General:
1. It is the intent of this Division that complete responsibility in the supplying of the control panel, and all instrumentation listed for Division 16 in Section 16940 Appendix "A" Device Index and other equipment required for this project be supplied by one System Supplier. This responsibility includes, but not limited to, all work necessary to select, furnish, program, supervise installation, calibrate, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein.
  2. The system supplier shall have an on staff project engineer with prior experience on similar sized projects. This project engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The system supplier project engineer shall attend all coordination meetings and be on-site when requested by the Owner's Engineer.
- B. Pre-Qualified System Suppliers
1. The Suppliers listed below have been determined to meet minimum qualifications specified in this Division and are pre-qualified by the Owner for providing supplier bids as system suppliers on the project.

- a. Tesco (phone 916 395-8800).
- b. Krug-Bixby-Long (KBL) (phone 510 887-1117).
- c. MCC Control Systems (formerly Meyer Controls) (phone 707 449-0341).

## 1.6 CONTRACT DOCUMENTS

- A. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error or omissions of detail in either shall not relieve the Contractor from the obligations thereunder to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.
- B. The Contract drawings are generally diagrammatic; exact locations of existing equipment and proposed location for new electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in this Section shall take precedence in the event of conflict.
- C. The Contract Electrical elementary, elevation and one-line diagrams are the basis of the electrical system to be provided and are for reference only. It is the Contractor's responsibility to adjust and make minor revisions to the diagrams as necessary for operational system at no additional cost to the Owner. Additional isolators, relays, wiring, terminal blocks, and appurtenances, shall be provided for an operation system at no additional cost to the Owner.
- D. Location of equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by existing conditions and coordination with other trades at no additional cost to Owner.
- E. The Conduit and Wire Routing Schedule, wire fill, and number of conduits are based on the best information available. It is the Contractor's responsibility to modify the conduit schedule based upon Shop Drawings for the actual equipment. Such modifications in conduit sizes and numbers of conductors shall be at no additional cost to the Owner, if such changes are the direct result of the equipment selected by the Contractor. A copy of the Conduit Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.
- F. Electrical & instrumentation, conduit & wire lengths shown on Contract Drawings are approximate. The Contractor is responsible for determining actual lengths for bidding and installation purposes. Contractor is to be made aware that equipment may be installed in the lower levels of the building.



- G. The Contractor shall examine the architectural, mechanical, structural, electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment.
- H. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.
- I. Provide means to furnish equipment and accessories, do the installation, complete connections, submit documentation, perform start-up, and be responsible for the warranty.
- J. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown, as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc. as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.
- K. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review.
- L. When existing conduits are to be used, it is the Electrical Contractor's responsibility to verify conduit size and routing. This includes all potholing or other location methods. Existing conductors and conduits damaged by Contractor during construction shall be repaired or replaced at no cost to Owner.
- M. The resolution of conflicting interpretation of the Contract documents shall be determined by the Engineer.
- N. The Contractor shall coordinate with other Suppliers on the project for a complete and operable system.
- O. It is the System Supplier's responsibility for obtaining and instrumentation transmitter configuration software, manuals and disks necessary for the Contractor to program and configure the instrumentation transmitters.
- P. The Electrical Contractor shall maintain a separate set of neatly and accurately marked set of Record Documents, consisting of spreadsheets, specifications and full size blue-line Electrical (E-Series) and Instrumentation (I-Series) Contract Drawings. These documents are to be used specifically for recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or document changes. These Record documents shall be kept up-to-date during the progress of the job, with all "change orders", submittal modifications, and construction changes shown and stamped with "As-Built" at end of job. These Record documents shall

not be used for daily construction use and shall not contain any mark-ups that are unrelated to as-built corrections.

1. The following lists the record documents shall be as-built by Electrical Contractor:
  - a. E-Series Drawings.
  - b. Panelboard schedules.
  - c. Conduit and Wire Routing Schedule.
    - 1) A copy of the Conduit and Wire Routing Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.
  - d. Lighting Schedule.
  - e. Duct banks and their routing with offset measurement and indicate changes in depth.
  - f. Solar Power System schematics.
2. The following lists the record documents that shall be as-built by System Supplier to be maintained by Electrical Contractor:
  - a. I-Series Drawings
  - b. Instrumentation Index
3. Record documents shall be kept current weekly with all "change orders", submittal modifications, and construction changes shown. Record Documents shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if Record Documents are not accurate or current.
4. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:
  - a. Additions - Red
  - b. Deletions - Green
  - c. Comments - Blue
  - d. Dimensions – Black

5. Show the following on the Electrical (E-Series) Record Contract Drawings by dimension from readily obtained base lines:
  - a. Exact location, type and function of electrical and instrumentation equipment and devices.
  - b. Precise routing and locations of underground conduits, pullboxes, junction boxes, and appurtenances that make-up the raceway system.
  - c. Show the dimensions, location and routing of electrical work, which will become permanently concealed.
  - d. Show complete routing and sizing of any significant revisions to the systems shown.
6. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

#### 1.7 COORDINATION

- A. The Contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the Engineer; with due regard to their work, and towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the Contractor shall bear expense of such changes as necessary to be made in work of others.
- B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.
- C. POWER UTILITY COORDINATION
  1. The Contractor shall field verify the locations for the underground primary and secondary conduit runs, pull boxes, and transformer pad with Utility representative prior to installation.
  2. Provide all the equipment and materials not provided by the power Utility Company for permanent service at the locations shown on the Contract Drawings. All work shall meet the requirements of the serving power Utility companies.
  3. Coordinate all work with the serving Power Utility, Pacific Gas and Electric (PG&E) for the new electrical service. The Contractor shall obtain the required inspections.
    - a. The Contractor shall arrange a pre-construction meeting with the PG&E representative prior to start of any Utility related work.

- b. All work shall be performed per the PG&E Engineered drawings and requirements at no additional cost to Owner.
  - c. Submit to the power Utility the proposed metering details. Provide a written statement from the Utility that shows approval of the proposed metering.
  - d. The Contractor shall provide and install all material, conduits, wiring, pull ropes, pole risers, pull boxes, transformer pads, bollards, and other work specified and shown on PG&E engineered drawings for new power service
  - e. Conflicts between the Contract drawings and the Utility Engineered drawings shall be brought to the attention of the Engineer. Contractor shall meet all Utility requirements at no additional cost to the Owner.
  - f. All fees and charges of the Utility power for new service hook-up will be paid by the Owner.
  - g. Coordinate with PG&E to obtain their approval for the grid tied system. Grid tied equipment shall be listed on the California Energy Commissions list of approved equipment ([www.consumerenergycenter.org](http://www.consumerenergycenter.org)) to meeting the requirements for the solar electricity system rebates (California Solar Initiative).
- D. Contractor shall be responsible for obtaining Utility Engineered drawings for service conductor conduits, pull boxes, wire size requirements, pull rope requirements, etc. Conflicts between the Contract drawings and the Utility Engineered drawings shall be brought to the attention of the Engineer.
- E. Schedule within 20 days after award of Contract all service installations and connections with utilities. Delays due to lack of effort by the Contractor which delay the project completion for lack of utility services will not be considered valid and Contract liquidated damages will be assessed.
- F. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Owner it is necessary to do so.
- G. Prior to commencing construction, the General Contractor shall arrange a conference with the General Contractor, Electrical Contractor, System Supplier, Resident Engineer & Owner as well as all equipment and system suppliers vital to the current phase of work. During the meeting, the equipment supplier shall verify types, sizes, locations, installation requirements, controls and diagrams of all equipment furnished. The Equipment and System Suppliers shall, in writing, inform the Engineer that all phases of coordination of this equipment have been covered and if there are any unusual conditions, they shall be enumerated at this time.

## 1.8 SUPERVISION

- A. The General Contractor shall schedule all activities, manage all technical aspects of the project, coordinate submittals and drawings, and attend all project meetings associated with this Division.
- B. The General Contractor shall supervise all work in this Division, including the electrical system general construction work, from the beginning to completion and final acceptance.
- C. The General Contractor shall supervise and coordinate all work in this Division to ensure each phase of the project, submittal, delivery, installation, and acceptance testing, etc. is completed within the allowable scheduled time frames.
- D. The General Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Division; which shall include transmittals, submittals, forms, documents, manuals, instructions, and procedures.

## 1.9 INSPECTIONS

- A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the Owner. If any material does not conform to the Contract documents, or does not have a favorably reviewed submittal status; then the Contractor shall, within three days after being notified by the Owner, remove said material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.
- B. The Contractor shall give the Owner 10 working days' notice of the dates and time for inspection. Date of inspection shall be as agreed upon by both the Contractor and Owner.
- C. Work shall not be closed in or covered over before inspection and approval by the Owner Construction Manager. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.
- D. The Contractor shall cooperate with the Engineer and provide assistance at all times for the inspection of the electrical system under this Contract. The Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work that, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.
- E. Before request for final inspection is made, the Contractor shall submit to the Owner in writing, a statement that the Contractor has made his own thorough inspection of the entire project enumerating punch list items not complete and that the installation and testing is complete and in conformance with the requirements of this Division.

- F. The Owner may arrange for a facility inspection by Cal-OSHA Consultation Service at any time. The Contractor shall make the necessary corrections to bring all work in conformance with Cal-OSHA requirements, all at no additional cost to the Owner.
- G. Contractor will be Responsible for any Additional Cost for Overtime, Weekend Overtime or Differential Time, Expenses for Inspection of Defective Work that has to be re-inspected.

#### 1.10 JOB CONDITIONS

- A. The Contractor shall make all arrangements and pay the costs thereof for temporary services required during construction of the project, such as temporary electrical power and telephone service. Upon completion of the project, remove all temporary services, equipment, material and wiring from the site as the property of the Contractor.
- B. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Engineer. Where equipment is stored or installed in moist areas, such as unheated buildings, etc., provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.
- C. The normal outdoor, not in direct sunlight, ambient temperature range of the job site will vary between 0 to 110 degrees Fahrenheit. All equipment shall be rated to operate in these temperature ranges or provisions for adequate heating and cooling shall be installed, at no additional cost to Owner.
- D. The jobsite is prone to vandalism and theft. Contractor shall be responsible for securing all materials and equipment against theft and vandalism for the duration of the project.
- E. Contractor & Subcontractors shall utilize temporary services during construction of the project. No Contractors shall utilize Chemical building power, receptacles, etc., during construction.

#### 1.11 SUBMITTAL AND DRAWING REQUIREMENTS

- A. Four (4) hardcopies of electrical submittals shall be submitted for favorable review by the Engineer. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.
- B. Electrical submittals shall be submitted for favorable review by the Engineer per this subsection. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

- C. A copy of the appropriate Division Specification Sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (√) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore, requested by the Contractor, each deviation shall be underlined and denoted by a unique number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Specifications. The submittal shall be accompanied by a detailed, written justification for each numbered item explaining variance or non-compliance with specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no review.
- D. The electrical submittals shall include but not be limited to data sheets and drawings for each product together with the technical bulletin or brochure. No FAX copies of documents are allowed. The electrical submittals shall include:
1. Product (item) name used herein and on the Contract Drawings.
  2. The manufacturer's model or other designation.
  3. Tag name/number per the drawings or schedules.
  4. Index Binder Tab Dividers.
  5. Detailed electrical one line, elementary control diagrams and interconnection diagrams showing all wiring requirements for each system. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.
  6. Complete documentation with full description of operation.
  7. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.
  8. Location of assembly at which it is installed.
  9. Input-output characteristics.
  10. Range, size, and graduations as required.
  11. Physical size with dimensions and mounting details.
  12. Enclosure fabrication and color.

13. Enclosure layout and elevation drawings to scale.
  14. Quantity and quality requirements for electric power, air, and/or water supply.
  15. Materials of construction of components.
  16. Nameplate schedule.
  17. Interconnection diagrams.
  18. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.
  19. A complete Bill of Materials list shall be provided at the inside of the front cover.
    - a. The Contractor shall provide Bill of Material formatted as shown in Appendix "A." A separate set of Material Listing forms shall be provided for each control panel and another listing all field equipment.
    - b. All spare parts shall be listed separately at the end of the Bill of Materials list.
    - c. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.
  20. A separate instrument data sheet shall be provided for each instrument per ISA S20 standards or approved equal. Provide an index with proper identification and cross-referencing of each data sheet.
  21. Submit CD disk copies of all submitted drawing in AutoCAD format.
  22. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.
- E. All drawings shall be drawn using AutoCAD, drawn in a professional manner and submitted on 11" x 17" sheets. Shop drawings shall be provided with minimum drafting details as illustrated on the Contract "electrical" series drawings. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. The shop drawings shall include:
1. Electrical one-line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one-line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; standby generator; automatic transfer switch, utility metering, voltage, amperage, number of wires and phases;



fault interrupt ratings; ground size and connections; neutral size and connections; power fail and other protective devices; fuse size and type; distribution transformer; panelboard; starters; contactor size and overload range; motor full load amperage of submitted motor and horsepower; rating for miscellaneous loads; etc. Submit a list for each piece of equipment containing the motor voltage, phase and full load amps with one-lines for verification of accuracy of submitted one line drawings.

2. Elementary diagrams shall be provided for all relay logic, power supplies, and other wiring. All elementary diagrams shall be drawn in EMP/EGP format and standards similar to those shown on the E-series elementary diagrams showing ladder rung numbers and coil and contact cross referencing numbers.
3. Enclosure and Elevation layout diagrams; show all front panel and backpan devices drawn to scale. Show fabrication methods and details; including material of construction, paint color, support and latching mechanisms, fans and ventilation system, and conduit entrance areas.
4. Analog and digital wiring diagrams showing the wiring requirements for each instrument loop. Graphic symbols shall conform with ISA S5.4 drawing standards. A loop diagram shall be furnished for each analog and digital control process. Loop diagrams shall include the following as a minimum:
  - a. The loop diagram shall be drawn with sufficient detail to express control philosophy. The diagram shall show all components and accessories of the instrument loop, highlighting special safety and other requirements. These diagrams shall be arranged to emphasize device elements and their functions as an aid to understanding the operation of a system and for maintaining or troubleshooting that system.
  - b. A separate drawing shall be prepared for each control panel. All termination points on the diagram shall be shown with the actual equipment identification, device and relay terminal number or letter, and P&ID English descriptor and tag name. A separate drawing shall be prepared for each card.
  - c. Energy sources - electrical power, air supply, pneumatic and hydraulic fluid supply, designating voltage, current, pressure, etc. shall be shown in detail on the diagram. Input and output signals (e.g., 1-5 VDC, 4-20 mA DC, 3-15 psig, etc.), power and instrument supplies to devices (e.g. 120 VAC, 24 VDC, 80 psig, etc.) shall be shown.
  - d. Engineering units shall be shown on the diagram. Each wire label, equipment identification terminal number or letter and color code shall be shown. Signal and DC polarities shall be shown.

- e. All spare wires, cables and termination points shall be shown. All jumpers, grounding, shielding, power supply details shall be shown.
5. Interconnections diagram shall show for each piece of equipment all wiring between all devices, panels, cabinets, terminal boxes, control equipment, motor control centers and any other devices and equipment. An interconnection diagram shall be furnished for each electrical and instrumentation system, even if one was not shown explicitly on the Contract Drawings. Interconnection diagrams shall be prepared for all conduits listed in the "Conduit and Wire Routing Schedule." Each interconnection diagram shall show the following as a minimum:
- a. Interconnect drawings shall be prepared for all equipment by the System Supplier.
  - b. The diagrams shall be utilized by the electrician during all phases of installation and connection of all conductors to ensure coordination of equipment interconnect.
  - c. The diagrams shall show wiring as field labeled at the end of the project when as-builts are submitted.
  - d. Each wire labeling code as actually installed shall be shown. The wiring labeling code for each end of the same wire must be identical.
  - e. All device and equipment labeling codes shall be shown.
  - f. Interconnections shall be shown point to point with identified lines. Diagrams of the wireless or wire schedule type are not acceptable. Bundled wires shall be shown as a single line with the direction of entry/exit of individual wires clearly shown. Interconnect diagrams shall not be combined with loop or elementary diagrams.
  - g. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter. This identification of terminations includes terminal blocks, junction boxes, all devices, computer I/O points, etc.
  - h. Diagrams shall include raceway numbers, raceway size, raceway type, cable numbers, wire color code, and wire numbers.
  - i. Each wire size, and cable size and color code shall be shown. Each conduit with the conduit label and conduit size and wire fill shall be shown. Wire and cable routing through conduits, wireways, manholes, handholes, junction boxes, terminal boxes and other electrical enclosures shall be shown with the appropriate equipment labels. All spare wires, cable, and termination points shall be shown. Cable shields shall be shown.

- j. Labeling codes for terminal blocks, terminals, wires, cables, panels, cabinets, instruments, devices, and equipment shall be shown. Place “øA”, “øB”, and “øC” label next to each breaker to identify phase connected to.
- k. Schematic symbols shall be used for field devices, showing electrical contacts. Signal and DC circuit polarities shall be shown.
- l. The diagrams shall show all other Contract and Supplier Drawing numbers, for reference, that are associated with each device that is interconnected.
- m. Attached to each interconnect, a copy of all the support documents used in preparing interconnects shall be submitted. This includes current issues of panel schematics, elementary diagrams, panelboard schedules, conduit schedules, one-line diagrams, connection diagrams, terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the “Reference Documents” corner of interconnect drawings.
- n. Interconnects shall include list of all applicable reference drawings, request for clarifications, field instructions and change orders. All deletions and additions of equipment, wire and cables shall be clearly shown.
- o. Field wiring shall not start before the interconnection Drawing has been submitted by the Contractor and approved by the Owner.
- p. Do not show the same wires or jumpers, or panel wiring on both the connection and interconnection diagrams. All jumper, shielding, and grounding termination details not shown on the connection diagrams shall be shown on the interconnection diagrams.
- q. Interconnection diagrams shall be submitted and approved by Owner for each electrical and instrumentation system. The Contractor shall not pull in any wires into conduits that do not have approved interconnects. If the Contractor pulls in wire without Owner approval of associated Interconnect Drawings, the Contractor will not be reimbursed for labor for re-pulling in wires even if there was an error in wire fill or sizing. Also, if the Contractor pulls in wire without Owner approval of associated Interconnect Drawings, then all progress payments related to field wiring for that particular area of work will be withheld until approved Interconnect Drawings are in use.
- r. All interconnection diagrams shall be prepared by a System Supplier under the supervision of or by a State of California Registered Electrical Engineer and shall bear that Engineer’s professional stamp and signature for all Interconnection Drawings

submitted for approval including as-builts and those used in the field installation. All deletions and additions of equipment, wire, and cables shall be clearly shown. Interconnects shall include list of all applicable reference Drawings, request for clarifications, field instructions, and change orders. Failure to provide backup references or signed and stamped drawings may be grounds for immediate rejection.

- s. Example format of Interconnection diagram is shown on Contract "E" Series Drawings or may be obtained from the Engineer.
- t. All Interconnection wires listed in the conduit schedule for each conduit shall be shown only on one interconnect drawing. Interconnect drawings submitted with wiring of a single conduit run separated onto multiple interconnect drawings will be rejected without review. A single conduit run with wiring shown on separate interconnect drawings will be allowed only after written approval is given by the Engineer for each conduit run prior to submitting the associated interconnect drawings.
- u. Only field wiring between Panelboards, Control Panels, and other electrical and instrumentation devices or equipment shall be shown on interconnection drawings. No internal panel wiring shall be shown on interconnect drawings except jumper or other wiring to be installed in field by Electrical Contractor.
- v. Interconnect Drawings along with the corresponding support documents shall be submitted in a separate submittal package. Interconnect drawings submitted with non interconnect drawing packages will be rejected. The latest support documents shall be obtained by system supplier from Contractor for all non-division 16 instruments, panels, and equipment, and included with interconnect drawing submittal. Support documents shall have their submittal number marked in upper right hand corner.
- w. Interconnect drawings shall be prepared for all equipment by the System Supplier.
- x. Provide a notes section on each interconnect drawing. In the note section, list any variances from the Contract conduit schedule necessary for completing the interconnections. Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires will not be processed until interconnect drawings have been received for such work.
- y. The field electrician shall mark-up all interconnection diagrams during installation to show accurate as-built wiring, conduits runs, terminations, etc. If interconnection drawings are not properly as-built, the Electrical Contractor will have cost deducted from the Contract for the Owner to field verify and prepare as-built interconnection drawings. The amount of the deduction shall be

determined on a time and material basis. The cost of such work shall be \$120.00 per hour plus expenses.

- z. The system supplier shall be responsible to collect all information necessary to complete each interconnection drawing. This includes making field trips to collect all terminal connection data for new and existing, panels, switchboards, panelboards, instruments, equipment and electrical panels.
  - aa. An index of drawings shall be provided with each Interconnection submittal listing the unique drawing number and the description of the interconnect drawing (e.g. Drawing 4321-IC1004 Pump 1004 Interconnect Drawing).
  - bb. Provide conduit and interconnect drawing cross reference indexes. Interconnect Conduit Index shall list all conduits listed in the Conduit & Wire Routing schedule and its associated Interconnection Drawing number. An Interconnection Drawing Index shall list all Interconnection drawings and the conduits shown on that specific drawing. These two indexes shall be at the front of all interconnection drawing submittals.
  - cc. Interconnection submittals that contain more than two motor control panels/centers shall have heavy duty dividers with permanent plastic labeled index tabs separating each group of drawings.
6. Submit drawings of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the Owner. Submittal to include the following:
- a. Dimensions of nameplate.
  - b. Exact lettering and font for each nameplate.
  - c. Color of nameplate.
  - d. Color of lettering.
  - e. Materials of construction.
  - f. Method and materials for attachment.
  - g. Drawing showing location of nameplate on each panel.
7. Submit schematic (ladder, elementary, loop) diagrams for all power and controls. Submit detailed shop drawings for completed Solar Power System, including layout showing solar panels supports.

- F. Each submittal shall be bound in a three ring binder, which is sized such that when all material is inserted, the binder is not over 3/4 full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable.
1. Each binder shall be appropriately labeled on the outside spine & front cover with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.
  2. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and sub tab section. Also, list the project name, contract number and equipment supplier's name, address, phone number, and contact person on the index page. Index dividers (tabs) shall be provided to separate each section.
  3. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Catalog cuts shall be ordered in the same sequence as their corresponding Contract specification subsection.
  4. All copies shall be clear and legible. Data sheets shall be provided for each instrument, with an index and proper identification and cross-referencing.
  5. Exceptions to the Contract specifications or drawings shall be clearly defined by the equipment supplier.
    - a. Data shall contain sufficient details so a proper evaluation may be made by the Engineer. Contractor shall provide separate letter (located in the front of the submittal) detailing specific exceptions to the Contract Specifications or Drawings.
    - b. Exceptions that are noted in the marked-up Drawings or Specifications, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents
  6. Request for information (RFIs) shall not be included in submittals. RFIs shall be submitted separately in its individual submittal number.
  7. Resubmittals shall be provided with a copy of the previous submittal comments and a separate letter, on company letterhead, identifying how each submittal comment has been addressed in the resubmittal.
  8. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.
- G. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Catalog cuts shall be ordered in the same sequence as their corresponding Contract specification subsection.

- H. Drawings shall be submitted in a separate hole-punched binder that covers the entire 11" X 17" length of the Drawing:
1. Shop Drawings with less than 20 sheets total in the submittal, may be provided in an 11½-inch by 17½-inch reinforced folder.
  2. All Interconnection Drawings or Shop Drawings of 20 sheets or more shall be provided in separate heavy duty three-ring binder to allow drawings to be easily removed. Binder shall be Cardinal D-Ring Easy Open Ledger Binder with locking D-Rings or approved equal.
  3. Failure to provide drawing submittal in correct binder format may be grounds for immediate rejection without review.
  4. Each drawing title block shall contain the English description name for drawing contents (i.e. Lift Pump No. 1 Interconnect Drawing) and drawing number. All pages and drawings in the submittal shall be numbered sequentially (with no number skipped) in lower right hand corner.
  5. Drawings that are "C" or "D" size shall be folded, with the title block visible and placed in reinforced clear plastic pockets.
- I. Catalog cuts and drawings shall be submitted for all devices and components in the electrical system.
- J. The Supplier shall coordinate submittals with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittals, so that one will not be delayed for lack of coordination with another.
- K. No submittal documents shall be labeled as proprietary. Labeling documents as proprietary will be sufficient cause for rejection of entire submittal. The Owner reserves the right to copy or duplicate any and all portions of the documents provided for the project including copyrighted documents as desired.
- L. No material or equipment shall be allowed at the job site until the submittal for such items has been favorably reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted."
- M. Identify all submittals by submittal number on letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:
1. 1st submittal: 1.
  2. 1st resubmittal: 1A.
  3. 2nd resubmittal: 1B, etc.
- N. The equipment specifications have prepared on the basis of the equipment first named in the Specifications. The Supplier shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required, at no additional cost, to meet Specifications.

- O. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Supplier's expense, by an unbiased laboratory satisfactory to the Engineer.
- P. Electrical submittals shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

#### 1.12 CHANGE ORDER PRICING

- A. All change order pricing by Contractor or System Integrator shall be broken out into the following minimum categories:
  - 1. Labor per hour listed per discipline, i.e. Engineer, Drafter, Estimator, Programmer, Secretarial, etc.
  - 2. Materials and equipment itemized per component and quantity.
  - 3. Rentals, travel, per diem, etc.
  - 4. Tax.
  - 5. Shipping.
  - 6. Overhead and profit.
- B. Lump sum change order pricing is not acceptable.
- C. If Contractor or System Integrator refuses to provide a change order with broken out pricing, the Engineer reserves the right to obtain independent estimates from other Contractors or System Integrators. The Contractor or System Integrator who refused to provide the change order with broken out pricing will be charged for the preparation of the independent estimates.



## PART 2 – MATERIALS

### 2.1 QUALITY

- A. It is the intent of the Contract specifications and drawings to secure the highest quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.
- B. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses that may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed and braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of doubtful durability shall not be used.
- C. Products that are specified by manufacturer, trade name or catalog number established a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.
- D. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment.
- E. When required by the Contract specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.
- F. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator interaction when power is restored.
- G. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 VDC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.
- H. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.

- I. It is the System Supplier's responsibility to visit jobsite to collect and document existing conditions and equipment device part numbers in order for all similar called out new equipment to match existing.

## 2.2 NAMEPLATES AND TAGS

- A. Equipment exterior nameplates - Nameplate material shall be rigid laminated black phenolic with beveled edges and white lettering; except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the drawings. No letters are allowed smaller than 3/16". Securely fasten nameplates in place using two stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable. Engrave the nameplates with the inscriptions as approved by the Engineer in the submittal.
  1. For each major piece of electrical equipment provide a manufacturer's nameplate showing the Contract specified name and number designation, the manufacturer's name, model designation, part number, serial number, and pertinent ratings such as voltage, amperage, # of phases, range, calibration, etc.
  2. For each device with a specific identity (pushbutton, indicator, instrument, etc.) mounted on the exterior or deadfront of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device.
  3. For all receptacles and switches, provide a faceplate engraved or stamped with the panelboard and circuit number it is fed from. Also, include on faceplate or on a separate nameplate for each light switch identification use such as "OUTSIDE BUILDING LIGHTS," "PERIMETER LIGHTS," etc.
  4. All field instruments and devices shall be labeled with designation shown on P&ID diagrams.
  5. All transformers and panelboards shall have nameplates with 1/2" high letters and be engraved with designations as shown on one-line Drawings.
  6. All safety and disconnect switches shall have nameplates with 1/2" high letters and be engraved with designations as shown on one-line drawings.
- B. Equipment Interior Nameplates - Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering. The size of the nameplate tape shall be no smaller than 2" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. Add additional clear glue to

hold the nameplate securely in place when necessary. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device used on the submittal drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal.

- C. Equipment Tags - When there is no space or it is impractical to attach an engraved phenolic nameplate with screws, as is the case with most field devices and instruments, the Contractor shall attach a tag to the equipment with the same inscriptions as specified above in paragraph A. The tag shall be made from stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall be attached to the equipment with stainless steel wire of the type normally used for this purpose. SST wire shall be crimp connected. Twisting ends together is not acceptable.
- D. Engrave or machine print the tags with inscriptions as approved by the Engineer in the nameplate submittal.
- E. Provide temporary labels for all instruments and devices immediately when installed. Temporary labels shall be provided with 1/2" letters minimum and labeled with P&ID tag number.

### 2.3 WIRE

- A. This section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.
- B. Material - Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name. All wire shall conform to the following:
  - 1. Conductors shall be copper, with a minimum of 98% conductivity.
  - 2. Wire shall be Class B stranded.
  - 3. Insulation of all conductors and cables shall be rated 600 volt.
  - 4. Insulation type for conductors smaller than #6 AWG shall be moisture and heat resistant thermoplastic THWN, rated 90 °C in dry locations and 75 °C in wet locations, or approved equal. Conductors #6 AWG and larger shall be XHHW insulation rated 90 °C in dry locations and 75 °C in wet locations.
  - 5. Field wire minimum AWG sizes:
    - a. #12 for wires used for individual conductor circuits 100 volt and above.

- b. #14 for wires used for individual conductor circuits below 100 volt.
- 6. Nonfield or equipment wire minimum AWG sizes:
  - a. #14 for wires used for individual conductor circuits 100 volt and above.
  - b. #18 for wires used for individual conductor circuits below 100 volt.
- 7. Instrument wiring:
  - a. General: Instrument cables shall have 600V rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.PR.) cables shall be Belden, or approved equal.

C. Color code - color code of all wire shall conform with the following table:

WIRES COLOR CODE TABLE

DESCRIPTION	PHASE/CODE LETTER	FIELD WIRE WIRE OR TAPE COLOR	NON-FIELD WIRE COLOR
480 V, 3 PHASE	A	BROWN	BROWN
	B	ORANGE	ORANGE
	C	YELLOW	YELLOW
240 V or 208 V, 3P	A	BLACK	-
	B	RED (ORANGE if high leg)	-
	C	BLUE	-
240 / 120 V, 1 P	L1	BLACK	BLACK
	L2	RED	-
12V POSITIVE	12P	DARK BLUE	DARK BLUE
12V NEGATIVE	12N	BLACK/RED STRIPE	BLACK/RED STRIPE
24V POSITIVE	24P	PINK	PINK
24V NEGATIVE	24N	BLACK/WHITE STRIPE	BLACK/WHITE STRIPE
AC CONTROL		VIOLET	RED (YELLOW FOR FOREIGN CIRCUITS)
DC CONTROL		BLUE	BLUE
NEUTRAL	N	WHITE	WHITE
GROUND	G	GREEN	GREEN
SHIELDED PAIR	+	CLEAR (WHITE)	CLEAR (WHITE)
	-	BLACK	BLACK

- 1. Note #1: High leg of open delta shall be colored orange per NEC 110.15.

D. Wire Marking:

1. Wire identification: All wire terminations including field interconnect as well as wiring interior MCC cubicles, switchboard, panels, control panels, equipment, junction panels and boxes shall be identified with machine printed labels. Hand lettered labels are not acceptable and shall be replaced at the Contractor's expense. The wire identification code for all field interconnect and panel interior wiring, shall be similar to the designations shown on the Contract example drawings.
2. Wire Labels: The labels shall be machine printed with indelible ink, heat shrink type capable of accepting a minimum of 23 machine printed characters per sleeve label by Brady "Bradysleeve" or equal. Labeling shall be neatly installed for visibility and shall be clearly legible. Each wire and conductor shall be labeled with wire label as shown on approved loop, elementary and interconnect Drawings. Labels shall not be wrap-around or snap-on type.
3. Where there is insufficient space for labels on locally interconnected neutral wires such as jumpers between adjacent auxiliary relay coil neutral terminals, these labels may be omitted. "Locally" is defined as wires no longer than 8".
4. Wire labels for lighting and receptacles shall be installed and consist of the panelboard and circuit number (i.e., Panelboard "LP1", circuit breaker #3 would have wire label line "LP1-L3" and neutral "LP1-N3").
5. All spare wires shall be labeled with equipment number followed by SP1, SP2, etc. (i.e. P11001-SP1 for first spare wire).
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

E. SPECIAL PURPOSE WIRING

1. Manufacturer Supplied Cables (MNFR CBL): Cables and wiring for special systems shall be provided by the manufacturer with the equipment and installed per the manufacturer's recommendations.

2.4 CONDUIT, RACEWAYS, AND WIREWAYS

- A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.
1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
  2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings;

which shall take precedence over any general methods and materials specified in this Section.

3. The minimum size conduit shall be  $\frac{3}{4}$ -inch unless indicated otherwise on the Drawings or for special connections to equipment. Buried, encased, or conduits located in walls shall be 1-inch minimum.
4. Conduit stubs for future use shall be capped with coupling, nipple, plug and cap and each end identified with conduit labels.
5. Conduits to be abandoned that protrude above graded shall be cut flush and filled with grout
6. Conduits shall not be filled to more than 50% of their total cross – sectional area.
7. CONDUIT MARKING
  - a. All conduits and raceways listed in Conduit & Wire Routing Schedule shall have conduit tags at both ends of each conduit segment. This includes all conduits in pullboxes and vaults.
  - b. Tag material shall be rigid laminated red phenolic with white lettering. The size of the tag shall be 2" diameter. No letters are allowed smaller than  $\frac{7}{16}$ ". Tags shall be heat and UV resistant, stain-proof, electrically non-conductive and non-corroding. Securely fasten tags in place using stainless steel aircraft cable, crimp connected. Engrave the tags, on both sides, with the conduit number. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Custom B-1, or approved equal.
  - c. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have  $\frac{1}{2}$ -inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

#### B. GALVANIZED RIGID STEEL CONDUIT (GRS)

1. Rigid steel conduit, couplings, bends and nipples shall be in accordance with ANSI C80.1 and UL-6.
2. Hotdip galvanized inside and outside after fabrication and then coated with a zinc bichromate finish. Provide threaded type fittings, couplings, and connectors; set screw type and compression type are not acceptable.
3. Minimum trade size - three-quarters inch ( $\frac{3}{4}$ ") unless otherwise shown on Contract Drawings.

4. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
5. Galvanized rigid steel factory elbows for 90 degree transitions.
6. EMT or IMC is not considered an equivalent to GRS.
7. GRS conduit is allowed only when specifically called out in the "Conduit and Wire Routing Schedule."

C. GALVANIZED RIGID STEEL CONDUIT - PVC COATED (GRS-PVC)

1. Standard weight, galvanized conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. GRS-PVC conduit and fittings to be Robroy Plasti-bond Red or approved equal.
2. Provide PVC coated galvanized rigid steel factory ells for 90 degree transitions.
3. Fittings and boxes shall be stainless steel or galvanized cast ferrous metal with a PVC 40 mils thick coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable.
4. All junction boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness, except where stainless steel boxes are called out.
5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
6. Support channel and pipe straps shall be PVC coated. Exposed metal/nuts, all-thread rod shall be 316 stainless steel.
7. PVC coating patching material shall be as provided by the manufacturer.

D. PVC CONDUIT, (PVC-40 OR PVC-80)

1. Shall be high impact polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. Shall be UL listed and labeled for "direct" burial.
2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.

3. Each underground run shall be placed in a trench with a minimum of four (4) inch sand bed evenly compacted on all sides, top and bottom.
4. Bends, elbows, and risers shall be made with PVC coated galvanized rigid steel (GRS-PVC) conduit using threaded adapters. Bond each metallic portion to each other and to equipment connected at each end of conduit run.
5. PVC fittings shall have solvent-weld-type conduit connections.
6. PVC conduit shall be stored on a flat surface and shielded from the sun.
7. PVC conduit shall not be used above grade.

E. LIQUID TIGHT FLEXIBLE METAL CONDUIT - (SEAL TIGHT)

1. Minimum trade size one-half inch (1/2").
2. All flex conduits shall have water tight outer jackets.
3. Connectors:
  - a. Non-NEMA 1 or 12 areas: PVC coated metallic with insulated bushings.
  - b. NEMA 1 or 12 areas: Metallic with insulated bushings.
4. Flexible conduit lengths shall not be greater than 36 inches.
5. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.
6. Flexible conduit shall only be installed in exposed or accessible locations.
7. Flexible conduits shall be used for conduit coupling to all vibrating and shifting equipment.

2.5 DEVICES

A. FUSES

1. Fuses used in circuits 200 VAC and above shall be time- delay type FNQ or approved equal, 13/32" x 1½", and have an interrupting rating of 10,000 AIC at 500 VAC. Fuse holders shall be of the barrier type and rated 600 VAC.
2. Fuses used in 120 VAC shall be time-delay type MDL or approved equal, 1/4" x 1¼", and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.



3. Fuses used in signal and 24 VDC circuits shall be fast acting type ABC or approved equal, 1/4" x 1 1/4", and have an rating of 250 VAC. Fuse-holders shall be of the terminal block type.
4. Fuses shall be sized in conformance with the NEC.

#### B. SWITCHES AND PUSHBUTTONS

1. Switches (HS) and pushbuttons (HC) for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, standard 30 mm diameter, with round plastic clamp ring. Switches shall be Allen-Bradley 800H, IDEC ITE, or equal.
2. Switches and pushbuttons shall have contacts rated 10 amperes continuous and 600 VAC. Contract blocks shall have IP2X finger-safe protection.
3. Manufacturer's standard size legend plates shall be provided and engraved to specify each switch and pushbutton function. The legend plate color shall be black.
4. Selector switch handles and pushbutton caps shall be black.
5. Selector switches for hand-off-auto (HOA) applications shall have the hand position to the left, off in center, and auto in the right position.
6. Lockout stop shall be a pushbutton with red cap and pad locking assembly for pushbutton.

#### C. RELAYS AND TIMERS

1. General: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Contract drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise stated. Supply power or coil voltage shall be 120 VAC unless shown otherwise on the Contract drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. The following is a summary of abbreviations associated with relays and timers:

CR	-	Control Relay
TR	-	Timing Relay
PFR	-	Power Fail Relay
TDOE	-	Time Delay On Energization
TDOD	-	Time Delay On De-Energization

2. Control Power relays (CR) shall be plug-in type with indicating lights and clear see-through sealed or enclosed housing to exclude dust. Sockets for plug-in relays shall be standard industrial type octal 8 or 11 pin with barrier pressure screw terminals. Provide IDEC Type RR, Potter and Brumfield KU, or approved equal. Two form-C contacts (minimum) shall be provided on each relay.
3. Interposing Control relays (CR) shall be plug-in type with indicating lights enclosed housing to exclude dust. Provide Finder 4C series or approved equal.
4. Time delay relays (TR) on energization or de-energization shall be solid state plug-in relays with a timer adjustable over the range 1 second to 3 minutes unless other ranges are indicated or required. Provide LED timer energized indicator lamp. Sockets for plug-in timers shall be standard industrial type octal 8 or 11 pin with barriered pressure screw terminals. Time delay relays shall be IDEC RTE, SSAC TD, or approved equal.
5. The power fail relay (PFR) shall continuously monitor the three phases for power loss, low voltage, phase loss, and phase reversal. The power fail monitor shall have a drop-out voltage adjustment, an adjustable delay on make time delay (0.2 to 8.0 minutes) and a status indicating LED. Power fail relays shall be Diversified SLJ, Time Mark, or approved equal.

#### D. INDICATING LIGHTS

1. Indicating Lights for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, High intensity multi-chip LEDs, full voltage (unless shown otherwise), standard 30 mm diameter, with round plastic lens and miniature bayonet lamp base. Indication lights shall be Allen-Bradley 800H, IDEC ALD, or approved equal.
2. Manufacturer's standard size legend plates shall be provided and engraved to specify each light's function. The legend plate color shall be black.
3. Indicating lights designated "PTT" shall be provided with a push-to-test switch and wiring.
4. Indicating light type and color of lens shall be as shown on the Drawings or specified in the Contract documents. Lamp color will be as follows:
 

a.	Open/On	Green
b.	Closed/Off	Red
c.	Alarm	Amber
d.	Power On	White

## E. CIRCUIT BREAKERS

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action or Motor Circuit Protectors (MCP) as shown on One-Line Diagrams. Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces specified are not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all poles to open. Circuit breakers and motor circuit protectors shall be manufactured by Eaton, G.E., ITE, or approved equal.
2. Each 480 volt or 240V circuit breaker shall have a minimum interrupting capacity of 35,000 amperes. Each 120 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.
3. Fused disconnects shall not be used in place of breakers.

## F. SURGE PROTECTIVE DEVICE

1. The surge protective device (SPD) shall be rated for use on a 3 phase system at voltage shown on Contract One Line diagram. The transient current the surge protective device shall dissipate 80,000 amps minimum. The SPD shall also have a maximum transient energy (10x1000  $\mu$ sec waveform) per phase of 2,560 joules. Provide fuses feeding the SPD. Locate SPD so that the indicating lights are viewable without removing panels. The surge protective device shall be Leviton 32000 series, or approved equal.

## G. MOTOR STARTERS

1. Motor starters (M) shall be magnetically operated, electrically held, full voltage, nonreversing except as shown on the Drawings. NEMA sizes shall be as required for the horsepower of the supplied equipment. Contactors shall be UL rated and listed. Motor starters shall be Allen-Bradley Bulletin 509, Square D or approved equal.
2. Each motor starter shall have a 120 volt operating coil rated for continuous operation.
3. Auxiliary contacts shall be provided as shown on the Drawings or as required. Each motor starter shall be furnished with a minimum of two spare auxiliary contacts in excess from those shown to be used. Auxiliary contacts shall be convertible, in the field, from normally open to normally closed, or vice versa.
4. Starters shall have adjustable bi-metallic overload relays. Adjustable overload relays shall be adjustable for trip point and for automatic or manual reset. Each overload shall be ambient compensated with a visible

trip indicator. Each overload shall be ambient compensated and shall trip on 600% of full load current in less than 6 seconds. Each overload relay shall have a test trip pushbutton built-in and an adjustable calibrated trip with indicating dial. Three-phase starters shall have 3 overload relays. Each overload relay shall have a normally closed holding contact and a normally open isolated contact for overload shutdown. Motor Overloads shall be Allen-Bradley, Square D or approved equal.

## H. TERMINAL BLOCKS

### 1. CONTROL PANEL TERMINAL BLOCKS

- a. Terminal blocks to be clamp type, 6mm spacing, and 600 volt, minimum rating of 30 amps, and mounted on DIN rail, Entelec M4/6 colored. DIN rail shall be same type as used for the relays. Install an extra DIN rail on each type of terminal strip with 4 terminals for future additions.
- b. Provide terminal blocks with "follower" plates which compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks which compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.
- c. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end (i.e.: TB1, TB2, etc.) and plastic marking strip running the entire length with a unique number for each terminal. On each terminal strip, terminal numbers shall be assigned starting with #1 at one end, incrementing in alphanumerical order (i.e.: 1,2,3,4....). Numbers shall be assigned to all blocks except grounding blocks. Fuse blocks shall be assigned unique tag numbers such as FU1, FU2. No two fuses shall be assigned the same tag number.
- d. Plastic marking tabs shall be provided to label each terminal block. These marking tabs shall have a unique number/letter for each terminal which is identical to the "elementary" and "loop" diagram wire designation. Numbers on these marking strips shall be machine printed and 1/8 inch high minimum.
- e. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.
- f. Provide a ground terminal or connection point for each grounding conductor.

- g. Provide a separate common or neutral terminal for every two (maximum) inputs and/or outputs.
2. Power Termination Blocks shall be rated for 600V main power connection. The power termination blocks shall be rated to accept Copper or Aluminum cable rated as shown on Contract one-line diagrams. The power termination block shall be capable of being mounted anywhere in a termination box. Each termination block shall be provided with lug shield to prevent contact with power connections. The power termination blocks shall be Connectron or approved equal.

#### I. BOXES

1. Device boxes shall be cast or galvanized steel type with shape and size best suited for the particular application, rated for the location installed, and shall be supported directly to support structure by means of stainless steel screws, anchors, or bolts.
2. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC 314 requirements.
3. Boxes exposed to the weather or in moist locations where GRS-PVC conduits are to be used shall be weatherproof (WP) PVC coated cast type with threaded hubs or stainless steel with watertight myers hubs.

#### J. SWITCHES

1. General purpose switches shall be manufactured in accordance with UL 20. Switches shall be one pole rated, 20 amps, at 277 VAC. Bodies shall be of ivory phenolic compound supported by mounting strap having plaster ears. Switches shall have copper alloy contact arm with silver cadmium oxide contacts. Switches shall have slotted terminal screws and a separate green grounding screw. Furnish Hubbell 1221, Leviton, or approved equal.

#### K. RECEPTACLES

1. General purpose receptacles shall be duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals. Face color shall be brown in industrial areas and white or ivory in finished areas. General purpose receptacles shall be Bryant, Hubbell, or approved equal.
2. GFI (ground fault circuit interrupting) receptacles shall be used for providing power to miscellaneous cord powered equipment. GFI receptacles shall be duplex, 20A, 120V, with "test" and "reset" buttons with shallow design for mounting and standard screw terminals for direct wiring. Receptacles shall be designed, manufactured, and tested to prevent nuisance tripping from voltage spikes, RFI, EMI, or electronic component failures. Chaining multiple receptacles from one GFI unit is

not acceptable. GFI receptacles shall be Arrow-Hart "specification grade", Leviton, or approved equal.

#### L. DEVICE PLATES AND COVERS

1. General purpose device plates and covers shall be anodized aluminum. Plates or covers shall be attached with stainless steel screws. Circuit breaker number and panelboard name shall be stamped on each cover.
2. PVC coated device boxes shall have PVC coated gasketed covers.
3. Weatherproof switch, outlet, and receptacle boxes shall be fitted with gasketed covers rated for wet locations in accordance with NEC 406.9.
4. Weatherproof switch, outlet, and receptacle boxes shall be fitted with cast aluminum gasketed cover rated for wet locations. Each receptacle access cover shall have a gasketed spring door to maintain the weatherproof integrity with plug inserted in accordance with NEC 406.9 for unattended locations. Final decision of type of access cover for specific location shall be per Engineer. Screws and hinge springs shall be 316 stainless steel. Receptacles located outside shall have tumbler key lock.
5. Weatherproof access covers shall be Hubbell, Crouse-Hinds, or TayMac Safety Outlet Enclosures, or approved equal.
6. Receptacle and light switch plates shall be stamped or engraved as specified herein.

#### 2.6 ELECTRICAL ENCLOSURES AND BOXES

- A. Enclosures and boxes to be wall mounted, minimum 14 gauge, type 316 stainless steel with seams continuously welded & ground smooth, and fast access door latches. A copper ground bus shall be provided in the enclosure. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in box. Provide accessories consisting of breaker to disconnect incoming power, heater, fan, louvers, and thermostats. Enclosure shall be Hoffman, Circle AW or approved equal.

#### 2.7 UTILITY METERING

- A. Provide a dead-front type, utility metering cabinet as shown on one-line diagram drawing and elevation diagram drawing. Metering main shall include meter socket, factory installed breaker and test by-pass facility. Voltage and amperage ratings shall be as shown on one-line diagrams. Metering shall be rated for a minimum interrupting current shown on Contract Drawings.
- B. Wiring and terminal blocks within the cabinet shall be furnished as required. Control components mounted within the assembly, such as test blocks, power termination block, etc., shall be suitable marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

- C. Provide Service Entrance UL Label and necessary applicable service entrance features per NEC, local codes, and PG&E requirements.
- D. Metering cabinet shall be NEMA 3R construction for underground utility service.
- E. Metering to be approved in writing by Power Utility prior to the start of fabrication. The Contractor shall be responsible for obtaining written Utility approval of the metering cabinet. A copy of this written Utility approval shall be submitted to the Owner prior to shipment of Metering to jobsite.
- F. The Contractor shall obtain the required inspections and permits. City will pay all fees for the new service.
- G. The utility metering cabinet shall be manufactured by Circle AW or approved equivalent.

## 2.8 PANELBOARD

- A. The Contractor shall furnish a panelboard of the type indicated on the Contract E-series Plans and specified herein. Panelboard to be provided with breakers shown on Contract Drawings. Panelboard with a 240V high-leg (stinger) shall not be used.
- B. The panelboard shall comply with the applicable sections of UL, NEC, W.U.E.S.S.C., OSHA and NEMA and shall be manufactured by Westinghouse, Square D, ITT or approved equivalent.
- C. Provide a machine typed circuit directory on inside of panelboard of door breaker identification when panelboard is delivered to site. Update the panelboard legend at end of project to reflect as-built conditions.

## 2.9 GROUNDING SYSTEM

- A. The utility service entrance switchboard ground bus shall be tied to a building ground rod as per Contract E-Series Drawings.
- B. The main ground bonding wire from the ground shall extend up into the utility service entrance switchboard for the visible connection with a UL approved "ground clamp" attached to the ground bus. The main ground bonding wires shall be a #2/0 copper.
- C. The ground rod shall consist of not less than 10 continuous feet of 3/4 inch copper coated electroplated high grade carbon steel. The ground rod shall be a NEHRING type NCC, Weater 348 or approved equal. The ground rod shall extend up for visible connection of a UL approved "ground clamp" to the ground bus.
- D. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney Type GRC, Burndy Type GAR or GP, or approved equal.

- E. All ground rod, pipe, and steel plate and buried bond connections shall be made by welding process equal to Cadweld.
- F. Provide a 13 inch diameter, 9-inch nominal throat, concrete ground rod box, minimum 12 inches deep, with a cast iron traffic cover embossed or engraved "GROUND."
- G. Ground buses shall be provided in all electrical enclosures. Each ground bus shall be sized as shown on the Contract drawings or specified herein. The ground bus shall be adequately sized for the connection of all grounding conductors required per NEC. Screw type lugs shall be provided on all ground busses for connection of grounding conductors.
- H. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC Table 250.66, whichever is larger.
- I. Conduit grounding bushings shall be installed on all metallic conduits. Conduit grounding bushings shall be set screw locking type electra-galvanized malleable iron with insulation collar and shall be provided with a feed through compression lug for securing the ground bonding wire.
- J. Bonding wires shall be installed on all conduits with grounding bushings, expansion joints and for continuity of raceways transitions. Bonding wires shall be solid bare copper sized and installed per NEC 250.102. Bonding wires at endpoints shall be connected to enclosure ground bus or equipment grounding lug.
- K. Each ground bus shall be copper. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO CAN series or approved equal.
- L. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors.
- M. All raceway systems, supports, enclosures, panels, motor frames, and equipment housings shall be permanently and effectively grounded.
- N. One side of the secondary on all transformers shall be grounded to the ground bus.
- O. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.
- P. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main overcurrent protection.



- Q. All receptacles shall have their grounding contact connected to a grounding conductor.
- R. Branch circuit grounding conductors for receptacles or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.
- S. Negative side of all VDC power supplies shall be grounded.

## 2.10 FIELD CONTROL STATION AND CONTROL PANELS

### A. General

#### 1. Boxes:

- a. Boxes shall be U.L. listed with steel box NEMA rating per Device Index.
- b. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC 314 Requirements.
- c. Larger panels or boxes shall be provided to accommodate special temperature and moisture monitoring relays for pumps at no additional cost to Owner. Provide all associated wiring, drawings, etc. at no additional cost to Owner.

2. Provide nameplates per subsection Nameplates.

3. Devices shall be provided as specified under subsection Components.

## 2.11 SOLAR POWER SYSTEM

A. Solar power system shall be provided complete with all cables and mounting hardware. All miscellaneous solar power system accessories shall be provided and installed by the Contractor for complete and operational system (Solar City, Solar Depot, Sunwise or approved equal) to meet PG&E requirements:

### B. Solar Equipment:

1. Photovoltaic (PV) modules shall be 24VDC nominal, 235W (with cells beneath 3.6mm tempered glass and +/-3% power tolerance. Module shall be provided with plug and sockets pre-installed. Modules shall be provided with quick connectors and associated pole mounting equipment. Module shall be U.L. listed, Yingli Solar, YL235P-29b with quick connectors, Sharp or approved equal.

2. Solar Panel Mounting: Solar panels shall be securely mounted on multiple pole (single row) support system. System shall utilize welded steel components and stainless steel mounting modules. Provide additional hardware as necessary for a complete and operable system.

Mounting system shall be Direct Power and Water (DPW) Solar Power-Fab MPM-G2 system, Iron Ridge or approved equal.

3. DC Combiner shall provide a PV array disconnect for up to twelve circuit breakers. Combiner shall provide over-current protection and interconnection of multiple PV panels. Combiner shall be NEMA 3R, powder coated aluminum housing. Touch-safe input fuse holds shall be provided with blown fuse indication. Surge protective device (SPD) shall be factory installed, UL 1449 recognized. Combiner shall be Eaton, Outback Power System PSPV, or approved equal.
4. Inverter shall have 10-year comprehensive rating, stainless steel outdoor enclosure, anti-island protection (to prevent feeding power during utility outage), built-in load break, utility interactive and internal automatic sensing of site utility voltage. Inverter shall meet the requirements of UL 1741 regarding grid tied inverters. Inverters shall automatically synchronize with each other. Inverter shall be rated for 600V (max) DC input voltage, 240VDC output voltage and unity power factor. Inverter shall be temperature regulated by fan, rated for -13 to 113°F, 8750W PV, and meet requirement of IEEE-579 & 929. Inverter shall be provided with required protective/safety features for a grid-tied system to prohibit back feeding onto the utility system in the event of a utility system outage. Inverter panel shall be SMA America Sunnyboy 7000US, or approved equal.
5. DC disconnect switches shall be heavy duty, 3 wire, Class J 60A fused, NEMA 3R, padlockable handle, side opening, UL98 listed, rated for 600V. DC disconnect shall be Eaton, Square D, GE, or approved equal.

## 2.12 FIELD DEVICES

### A. LEVEL SWITCHING DEVICE

1. Each level switch shall utilize a Polypropylene float which moves with liquid level to actuate a hermetically sealed (non-mercury) microswitch. The level switch shall have Form "C" contacts with a minimum electrical with switch rating of 16 Amp at 120VAC. The float switch shall be suspended mounted with a weight. The level switch shall be MJK7030, Danfoss 7030, or approved equal.

## **PART 3 - EXECUTION**

### **3.1 ELECTRICAL WORKMANSHIP**

- A. All work in this Section shall conform to the codes and standards outlined herein.
- B. The Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improper installations at no additional expense to the Owner.
- E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

### **3.2 ELECTRICAL CONSTRUCTION METHODS, GENERAL**

- A. All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainer. Where space is available, such as in electrical cabinets, all wiring shall be run in slotted plastic wireways or channels with dust covers. Wireways or channels shall be sized such that the wire fill does not exceed 60%. Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wireways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles. Tie-wraps shall be T & B TY-RAP's, or approved equal.
- B. All devices shall be permanently labeled and secured in accordance with subsections labeled "NAMEPLATES AND TAGS."
- C. All field wires and panel wires have wire markers as specified in the "WIRE" subsection.
- D. All components associated with a particular compartment's or enclosure's function shall be mounted in that compartment or enclosure.
- E. Spacing and clearance of components shall be in accordance with UL, and NEC standards.
- F. Wires shall not be spliced except where shown. Devices with pigtails, except lighting fixtures, shall be connected at terminal blocks. Equipment delivered with spliced wires shall be rejected and the Contractor shall be required to replace all such wiring at no additional cost to the Owner.
- G. No wires shall be spliced without prior approval by the Engineer.

- H. Where splices are allowed or approved by the Engineer they shall conform with the following:
1. Splices of #10 and smaller, including fixture taps, shall be made with see-thru nylon self-insulated twist on wire joints; T & B "Piggys," Ideal "Wing Nut" or approved equal.
  2. Splices of #8 and larger shall be hex key screw two way connectors, with built in lock washers; T & B "Locktite", O-Z type XW, or approved equal, insulated with 3M Scotch Super #88, Plymouth, or approved equal.
  3. Splices in underground pullboxes shall be insulated and moisture sealed with 3M "Scotchcast" cast resin splice kits and shall have a date marking for shelf life. Do not use splice kits with a date marking for shelf life that has expired.
  4. Wire splicing devices shall be sized according to manufacturer's recommendations.
- I. Tapes shall conform to the requirements of UL 510 and be rated: 105 degrees C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mil black. Phase tape shall be 7 mil vinyl plastic, color coded as specified. Electrical insulation putty shall be rubber-based, elastic putty in tape form. Varnished cambric shall not be used.
- J. Connections to terminals shall be as follows:
1. Use connector or socket type terminals furnished with component.
  2. Connections to binding post screw, stud or bolt use:
    - a. For #10 and smaller wire, T & B "Sta-Kon", Buchanan "Termend" or approved equal, self-insulated locking forked tongue lug.
    - b. For #8 to #4/0 wire, T & B "Locktite", Burndy QA or approved equal lug of shape best suited.
  3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.
  4. Connections for all terminals shall be made with insulation stripped per manufacturer's instructions.
- K. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written "change order" authority by the Engineer. When field changes are made, the components, materials, wiring, labeling, and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the Owner.

- L. Mating fittings, bulkhead fittings, plugs, lugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.
- M. All electrical and instrumentation factory as-built drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

### 3.3 ELECTRICAL EQUIPMENT, GENERAL

- A. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device. Do not paint nameplates, labels, tags, switches, receptacles, conductors, etc.
- B. All doors shall be fully gasketed with nonshrinkable, water and flame resistant material.
- C. Bolts and screws for mounting devices on doors shall be as specified by the manufacturer; otherwise they shall have a flush head which blends into the device or door surface. No bolt or screw holding nuts shall be used on the external surface of the door.
- D. No fastening devices shall project through the outer surfaces of equipment.
- E. Each component within the equipment shall be securely mounted on an interior cubicle or backpan and arranged for easy servicing, such that all adjustments and component removal can be accomplished without removing or disturbing other components. Mounting bolts and screws shall be front located for easy access and removal without special tools. Access behind the sub panel or backpan shall not be required for removing any component.
- F. HARNESS: Where space is available, all wiring shall be run in slotted plastic wire ways or channels with dust covers. If space is not available for wireways, then all wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by stainless steel screw attached retainer. Wire ways or channels shall be sized such that the wire fill does not exceed 60%. Tie-wraps shall be T&B TY-RAP or approved equal.
- G. HINGE LOOPS: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or approved equal.

- H. **RETAINERS:** Wire ways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be T&B TC series or approved equal.
- I. **ROUTING:** Wires shall be routed in slotted plastic wire-ways with snap covers. Wires carrying 120 VAC shall be separated as much as possible from other low voltage wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible. Ducts for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined ducts is not allowed without prior written approval of the Owner. Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable. Wires and cables shall be placed in the ducts in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.
- J. Wiring not routed in duct work shall be neatly bundled, treed, and laced with plastic ties. Wiring across door hinges shall be carefully made up and supported to avoid straining and chafing of the conductors or from putting any strain on their terminals.
- K. **TERMINATIONS:** Single wire and cable conductors shall be terminated according to the requirements of the terminal device. All terminations must be made at terminals or terminal blocks. Use of spring or buttsplice connectors is not allowed.
1. Provide 2" minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of the Owner.
  2. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.
  3. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp type that forms gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug type and size being crimped.
  4. On shielded cables, the drain wire shall be covered with insulating tubing along its full bare length between the cable jacket and the terminal lug or terminal pressure plate.

5. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor.
  6. Heat shrink shall be placed on ends of shielded cable to cover foil.
  7. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e. solenoid valves, level probe, etc.)
  8. Terminate all status, control, and analog I/O wiring on terminal blocks, including spares. Provide additional relay, DIN rails, terminal blocks and side panels as required.
- L. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250.122, whichever is larger.
  - M. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC Tables 312.6 (A) & (B).
  - N. Future device and component mounting space shall be provided on the door, backpan, and subpanel where detailed on the Drawings. Where no detail is shown, provide a minimum of 15 percent usable future space.
  - O. Doors shall swing freely and close with proper alignment.

### 3.4 DELIVERY

- A. Contractor shall inspect each electrical and instrumentation item delivered to the jobsite.
- B. Contractor shall unpack each item for inspection within two (2) days of arrival.
- C. Complete written inventory shall be produced by Contractor and submitted to Owner within (2) days after arrival on jobsite for record keeping prior to any payment for the item.

### 3.5 DAMAGED PRODUCTS

- A. Damage products will not be accepted. All damaged products shall be replaced with new products at no additional cost to the Owner.

### 3.6 FASTENERS & LUGS

- A. Fasteners for securing equipment to walls, floors, and the like shall be 316 stainless steel. The fastener size shall match equipment mounting holes.

- B. Stainless steel anchor bolts, 1/2" minimum size, shall be installed for the Electrical Equipment in the front and back of each section at locations recommended by Electrical Equipment manufacturer.
- C. Concrete pad with stainless steel anchor bolts shall be provided for all electrical freestanding equipment.
- D. All wall mounted panels or enclosures shall be spaced out from wall by stainless steel unistrut or stainless steel spacers with minimum depth of 1/2".
- E. All wire & cable lugs shall be copper; aluminum or aluminum alloy lugs shall not be used. The Electrical Contractor shall supply all lugs to match the quantity & size of wire listed in the conduit & wire routing schedule.

### 3.7 INSTALLATION, GENERAL

- A. System:
  - 1. Install all products per manufacturer's recommendations and the Drawings.
  - 2. Contract Drawings are intended to show the basic functional requirements of the electrical system and instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.
- B. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the Owner:
  - 1. Provide additional devices, wiring, conduits, relays, signal converters, isolators, boosters, and other miscellaneous devices as required to complete interfaces of the electrical and instrumentation system.
  - 2. Changing normally open contacts to normally closed contacts or vice versa.
  - 3. Adding additional relays to provide more contacts as necessary.
  - 4. Installing additional terminal blocks to land wires.
- C. All programmable devices shall be programmed, set-up and tested by the Contractor prior to startup at the Contractor system supplier facility. This includes digital displays and instrumentation. Programming and set-up parameters shall be adjusted or changed as directed by the Owner or Engineer during start-up and throughout the warranty period, at no additional cost to the Owner.
- D. Coordinate with the Owner and setup all alarm, process, and operation setpoints.



E. Panels and Enclosures:

1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.
2. Install level and plumb.
3. Seal all enclosure openings to prevent entrance of insects and rodents.
4. Seal around bottom edge of all pad mounted enclosures to prevent entrance of insects, rodents, dirt, debris, etc.
5. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.66.
6. Box supports shall be located and oriented as directed in field by Owner.

F. Conduits and Ducts:

1. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.
2. Install conduit free from dents and bruises.
3. All conduits shall be labeled on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations.
4. A maximum of three equivalent 90 degree elbows are allowed in any continuous runs. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.
5. Route all above grade outdoor conduits or conduits in rated areas parallel or perpendicular to structure lines and/or piping.
6. Conduits installed outdoor or in NEMA 4X rated areas above grade shall be braced in place with stainless steel Unistrut stanchions or PVC coated clamps with backplates.
7. Conduit entrances: Seal each conduit entrance from below grade into the Panels, and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents.
8. Special "Soft-Jaw" type pipe clamps shall be used to prevent damage to PVC-coated conduits while field threading, cutting to length, and coupling sections.

9. Conduits shall be painted to match the color of surface attached to as directed by Owner.
10. All spares shall be mandrel and have pull ropes installed.
11. All existing conduits that are reused shall have a mandrel pulled through the entire conduit run to prove the length contains no blockages or obstructions. Mandrelling shall be witness by the Owner.

G. Conduit and Wire Routing Schedule:

1. Conduit material, wire size, and quantity listed in schedule take precedence over Division 16 Specifications.
2. All of the entries for each line in the conduit schedule apply to each conduit when multiple quantity of conduits multiple quantity of conduits (quantity of which are indicated by number entered in conduit no. column in schedule) are listed in the schedule.
3. Wire sizes listed are in AWG or Kcmil and are copper conductors.
4. Extra wire was intentionally placed in the "Conduit & Wire Routing Schedule" which shall be labeled on both ends with a unique wire label.
5. Contractor to supply and install all conduits and wiring as shown on Utility Engineered Design drawings. Utility primary and secondary conduit and wiring shown in "Conduit and Wire Routing Schedule" is for bid purposes only. A credit or add-on will be provided by Contractor based on the actual work performed by Contractor for the Utility service.
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.
7. Conduit entries listed as "GRS-PVC" in the Conduit & Wire Routing Schedule are to be "Galvanized Rigid Conduits with PVC coating" the entire length.
8. Vertical offsets and sloping of conduits are not detailed on plans; the Electrical Contractor shall include in his bid the price for the complete conduit run utilizing the civil & mechanical plans to measure vertical & slope distances.

H. Excavation and Back Filling:

1. The Electrical Contractor shall provide the excavation for equipment foundations and trenches for conduits or buried cables.
2. Trenches for all underground utility lines shall be excavated to the required depths.

3. Repave any area that was paved prior to excavation. Backfill and surface all areas as shown on the Drawings or where not shown to the original condition that was present prior to the excavation.
  4. Underground conduits outside of structures shall have a minimum cover of 24 inches except for utility conduits depth shall be as required by the governing utility requirements. Back filling shall be done only after conduits have been inspected.
  5. Contractor shall uncover any uninspected covered conduit trenches, at no additional cost to Owner, to verify proper installation.
  6. Excavation and back fill conduit trenches shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans, and to other entities as required.
  7. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.
- I. Wiring, Grounding, and Shielding - It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only (source end), the shield at the other end (receive end) shall be encased in an insulated material to isolate it from ground.
- J. Cutting and Patching - The Contractor shall do all core drilling, cutting and patching required to install his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching. Paint patched surfaces to match the original color.
- K. Seals
1. Seal around all conduits, wires, and cables penetrating between walls, ceilings, and floors in all buildings with a fire stop material. Seal shall be made at both ends of the conduit with a fire-stop putty. Seal shall have a minimum two hour rating. Fire stop sealing shall be International Protective Coatings Flamesafe, or approved equal.
  2. Seal around conduits entering outside to inside structures and around bottom of free standing enclosures to maintain watertight integrity of structure.
  3. Place conduit seal inside each underground conduit riser into panels and enclosures to prevent entrance of insects and rodents.
  4. Conduit entrances: Seal each conduit entrance from below grade into the panel and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents. Conduits between the

enclosures shall be sealed with plugging compound sealant on each end. Plugging compound sealant shall be PRC-DeSoto (formerly Courtaulds) Aerospace Semco PR-868 or approved equal.

L. Housekeeping Pads

1. Concrete housekeeping pads are required for all free standing electrical equipment. Housekeeping pads shall be 3-1/2" inches above surrounding finished floor or grade unless otherwise shown and shall be 4 inches (minimum) larger in width on all sides of equipment. The depth of housekeeping pads shall be 18 inches (minimum).
2. Housekeeping pads shall be installed for future units as shown on the Contract Drawings.
3. Housekeeping pad shall be Class "A" concrete with rebar crossway network. The minimum size rebar allowed is #4. Concrete shall be precisely leveled so that equipment set in place will not require shimming.

M. Cleaning and Touch up:

1. Prior to startup and at completion of the work prior to final acceptance, all parts of the installation, including all equipment, exposed conduit, devices, and fittings shall be cleaned and given touch up by Contractor as follows:
  - a. Remove all grease and metal cuttings.
  - b. Any discoloration or other damage to parts of the building, the finish, or the furnishings, shall be repaired.
  - c. Thoroughly clean any of his exposed work requiring same.
  - d. Vacuum and clean the inside of all electrical and instrumentation enclosures prior to applying power and a second time immediately prior to the final acceptance inspection.
  - e. Clean all above and below ground pull boxes, junction boxes, and vaults from all foreign debris prior to final acceptance.
  - f. Paint all scratched or blemished surfaces with the necessary coats of quick drying paint to match adjacent color, texture, and thickness. This shall include all prime painted electrical equipment, including enclosures, panels, poles, boxes, devices, etc.
  - g. Remove all decals and lettering from both sides of support plates.
  - h. Repair damage to factory finishes with repair products recommended by Manufacturer.

- i. Repair damage to PVC or paint finishes with matching touchup coating recommended by Manufacturer.

### 3.8 ELECTRICAL TESTING

#### A. GENERAL REQUIREMENTS

1. It is the intent of these tests to assure that all equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design plans and specifications.
2. All equipment setup and assembled by the Contractor shall be in accordance with the design plans and Drawings and the manufacturer's recommendations and instructions and shall operate to the Engineer's satisfaction. Follow all manufacturer's instructions for handling, receiving, installation, and pre-check requirements prior to energization. After energization, follow manufacturer's instructions for programming, set-up and calibration of equipment. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment which, in the opinion of the Engineer, has been caused by faulty mechanical or electrical assembly by the Contractor. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the Owner.
3. The testing shall not be started until the manufacturer has completed fabrication, wiring, and setup; performed satisfactory checks and adjustments; and can demonstrate the system is complete and operational. Certification of completion of Contractor's in-house tests shall be submitted prior to scheduling of factory testing.
4. Factory tests shall not be scheduled until submittals associated with the equipment have been approved by the Engineer.
  - a. If equipment is significantly different from submittal drawings, this shall be grounds for cancellation and rescheduling of factory tests at no additional costs to Owner or extension of Contract time.
  - b. Engineer reserves the right to postpone the factory test, at no additional cost to the Owner, until the submittal associated with the factory test has been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted." No extension of Contract time will be allowed.
5. The first Pre-Energization tests shall be performed to determine the suitability for energization and shall be completed with all power turned off and complete prior to the start of any of the Post-Energization Tests. The Electrical Contractor shall have qualified personnel on the job site for all Pre-Energization and Post-Energization tests.

6. All tests shall be witnessed by the Engineer and/or Owner personnel. The test forms shall be completed by the testing person for field checkout, testing, and calibration of all equipment and instruments. All filled in test forms shall be given to the Engineer and/or Owner the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy. All tests shall be documented in writing by the supplier and signed by the Engineer as satisfactory completed. The supplier shall keep a detailed log of all tests that failed or did not meet specifications, including date of occurrence and correction. Completed forms with proper signatures and dates shall be included and become a component of the Operations and Maintenance Manual for each of the respective systems.
7. Prior to any field testing, Interconnection Drawings and Operation & Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer.
8. The Contractor shall notify the Owner and the Engineer of the Supplier's readiness to begin all factory and field tests in writing (a minimum of ten working days prior to start), and shall schedule system checkout on dates agreed to by the Owner and the Engineer in order that the testing be scheduled and witnessed.
9. The Contractor shall fill in & submit for approval the "Scheduled Test Request Form" located in Appendix "A" for each requested inspection, factory and field test.
10. The supplier shall submit for approval, the proposed factory & field testing sheets at least 2 weeks prior to the start of the tests. Each testing sheet shall have a title giving the type of test and entry spaces for the name of the person who performed the test, name of the person who witnessed the test, and the date. Tests performed without approved forms shall be retested at no additional cost to Owner.
11. Separate test procedures in separate binders shall be submitted for approval for the Factory and Field Tests. Testing shall not commence until the test procedures have been reviewed and approved by the Owner. Tests forms shall be similar to those shown on Appendix "A."
12. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineering; these additional tests shall be done at no additional cost to the Owner.

**B. FAILURE TO MEET TEST**

1. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported to the Engineer. The Contractor shall replace the defective material or equipment and have tests repeated until test proves satisfactory to the Engineer without additional cost to the Owner.

### C. SAFETY

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturers' safety precautions shall be followed.
2. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular application and ensure personnel safety. Absolutely no tests shall be performed that endanger personal safety.
3. The Contractor shall have two or more personnel present at all tests.
4. Two non-licensed portable radios are to be made available by the Contractor for the testing organization to conduct tests.
5. California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): The Contractor is cautioned that testing and equipment shall comply with ESO and OSHA as to safety, clearances, padlocks and barriers around electrical equipment energized during testing.
6. Field inspections and pre-energization tests shall be completed prior to applying power to equipment.

### D. ELECTRICAL FACTORY TEST

1. The System supplier shall conduct a thorough and complete factory test by qualified factory-trained personnel witnessed by Owner per the criteria specified herein. Factory test shall be held within 150 miles of project location.
2. The "System set-up" for factory testing shall consist of, but is not limited to power pedestal, control panel, and any miscellaneous associated electrical equipment.
3. Temporary wiring and equipment shall be setup during these tests to simulate the complete assembled system.
4. The length of the factory testing for the "System setup" shall be a minimum of one (1) working day. If in the opinion of the Owner or Engineer the factory testing is not completed at the end of the working day, the testing shall be extended, at no additional cost to the Owner or extension in Contract time. The Contractor shall agree that the sum set forth hereafter is a reasonable amount to be charged as liquidated damages; and it is therefore agreed that the Contractor will pay the Owner the sum of five hundred dollars (\$500.00) in liquidated damages for each and every calendar day beyond the time prescribed above for the completion of factory testing for the System set-up. Liquidated damages will be assessed to the Contractor each and every day past the time allotted for factory testing.

5. All factory tests shall be conducted at the Supplier's facility. All factory tests shall be completed prior to shipment of any of the "System set-up" to the jobsite. The "System set-up" shall be fully assembled, programmed, and connected as it will be installed in the final configuration. If the "System set-up" is found to be not fully and completely ready for factory testing, the Contractor shall be responsible for paying for the Owner and Engineer to return for the factory testing. Factory testing is to ensure that there are no defects. The hardware and software shall be tested for compliance with the plans and Specifications included herein and for the ability to perform the control functions.
6. The testing shall not be started until the manufacturer has completed fabrication, wiring, setup, and programming; performed satisfactory checks and adjustments; factory testing sheets approved by Owner; and can demonstrate the system is complete and operational.
7. Provide a complete clean copy of System Supplier drawings for Owner and Engineer's use during Factory Test. These drawings shall reflect the equipment being tested. If Owner Representative determines that these drawings do not adequately reflect the actual equipment being tested or differs substantially from the approved equipment submittal, the Owner Representative reserves the right to cancel the Factory Test as the equipment is found to be not fully and completely ready for factory testing. Equipment that differs substantially from the approved equipment submittal shall be resubmitted. Factory test will be rescheduled after revised submittals have been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted." No extension of Contract time will be allowed.
8. The associated factory tests for each of the factory testing sheets that are to be performed by the supplier and witnessed by the Owner/Engineer shall include the following for the "System set-up" as a minimum:
  - a. Inspections of the panels as follows:
    - 1) Visual and mechanical:
      - a) Inspect for physical damage, proper support, and wiring.
      - b) Check all starters, breakers, and other components for proper sizes.
    - 2) The Contractor shall fill in test form TF4 located in Appendix "A."



- b. Testing of the Panels as follows:
- 1) Each line of control logic on the elementary or loop diagrams shall be checked. After a line of control logic is tested, the person performing test shall initial the corresponding line on the elementary diagram. When the complete elementary diagram has been checked, it shall be signed and dated by testing person and person witnessing test.
  - 2) Remote points to terminal blocks shall be simulated for the complete checkout of controls.
  - 3) The tests, as a minimum, shall simulate all operating conditions including steady state, transients, upsets, startup, shutdown, power failure, and equipment failure conditions (for control logic).
9. The factory test will be considered complete only when the system setup has successfully passed all tests, both structured and unstructured, to the satisfaction of the Owner or Engineer and the Factory Test checkout form TF11 has been signed & dated by Owner. No equipment shall be shipped to jobsite without authorization from the Owner or Owner's representative that the factory test has been completed.
10. Acceptance and witnessing of the factory tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.
11. The testing personnel shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.
12. During the testing period, under the supervision of the supplier, the Engineer and other Owner personnel shall have unlimited and unrestricted access to the usage and testing of all hardware and software in the system.
13. Spare parts for the system shall also be tested during this test period. The supplier shall prove by temporarily connecting the spare hardware to the system that any or all of the spare parts function in a manner equivalent to the original equipment under test.
14. The Contractor shall pay all expenses incurred by his personnel which includes labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during the factory testing.
15. Faulty and/or incorrect hardware operation of major portions of the system may, at the discretion of the Owner Engineer, be cause for suspension or restarting of the entire factory test, at no additional cost to the Owner or extension in contract time.

16. The factory test will be considered complete only when the system setup has successfully passed all tests both structured and unstructured to the satisfaction of the Owner Engineer. No equipment shall be installed without authorization from the Owner Engineer that the factory test has been completed.
17. All modifications to drawings and documentation as a result of the factory tests shall be corrected and completed before shipment of drawings with equipment and the submittal and delivery of "operation and maintenance" manuals.
18. Copies of the completed, signed, and witnessed factory testing forms shall be placed in the Operation and Maintenance Manual.

E. ELECTRICAL FIELD TESTS

1. The Contractor shall engage and pay for the services of an approved qualified testing company for the purpose of performing inspections and tests as herein specified. The testing company shall provide all material, equipment, labor and technical supervision to perform such tests and inspections. The Electrical Contractor shall be present on site for all field tests.
2. The Electrical Contractor shall complete and submit "Schedule Test Request Form" as illustrated in Appendix "A" for each electrical field test.
3. The Electrical Contractor shall be at the jobsite to assist with all Electrical Field Tests.
4. PRE-ENERGIZATION TESTS: These tests shall be completed prior to applying power to any equipment.

a. INSPECTIONS

- 1) Visual and mechanical inspections:
  - a) Inspect for physical damage, proper anchorage and grounding.
  - b) Compare equipment nameplate data with design plans and starter schedule.
  - c) Compare overload setting with motor full load current for proper size.
- 2) Performed NETA acceptance testing for each piece of equipment.
- 3) The Contractor shall fill in, for each piece of equipment, Test Form TF4 located in Appendix "A."

b. TORQUE CONNECTIONS

- 1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC Annex I for torque values as guidelines.

c. WIRE INSULATION & CONTINUITY TESTS

- 1) All devices that are not rated to withstand the 500V megger potential shall be disconnected prior to the megger tests.
- 2) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for 10 seconds. Make tests with circuits installed in conduit and isolated from source and load. Each field conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.
- 3) Each megger reading shall not be less than 10 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 10 Meg-ohms shall be replaced.
- 4) Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.
- 5) The Contractor shall fill in test forms Power and Control Conductor Test Form TF1 and Instrumentation Conductor Test Form TF2 located in Appendix "A."

d. GROUNDING SYSTEM TESTS

- 1) Visual and Mechanical Inspection:
  - a) Verify ground system is in compliance with Drawings and Specifications.

2) Electrical Tests:

- a) Before backfilling trenches, and placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.
- b) After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.
- c) The grounding test shall be in conformance with IEEE Standard 81.
- d) Measurements shall be made at 10 feet intervals beginning 25 feet from the test electrode and ending 75 feet from it in a direct line between the system being tested and the test electrode.
- e) Point-to-Point - Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3) Test Values:

- a) The resistance between the main grounding electrode and equipment ground shall be no greater than five ohms per IEEE Standard 142.
- b) Investigate point-to-point resistance values that exceed 0.5 ohms.
- c) The Contractor shall fill in Grounding System Test Form TF3 located in Section 16010 Appendix "A."
- d) Plots of ground resistance shall be made and submitted to the Engineer for approval.

e. PANELBOARD TESTS

1) Visual and Mechanical Inspection:

- a) Inspect for physical damage, proper anchorage and grounding.

- b) Compare equipment nameplate data with design plans and panelboard schedules.
  - c) Compare breaker legend for accuracy.
  - d) Check torque of bolted connections.
- 2) The Contractor shall fill in Panelboard Test Form TF5 located in Appendix "A."

f. BREAKER TEST

- 1) All breakers shall be checked for proper mounting, conductor size, and feeder designation. Operate circuit breaker to ensure smooth operation. Inspect case for cracks or other defects. Check tightness of connection with torque wrench in accordance with manufacturer's recommendations.
- 2) All breakers 100 amps and above shall be tested. Time current characteristic tests shall be performed bypassing three hundred percent (300%) rated current through each pole separately. Trip amps and time shall be measured. Instantaneous pickup current shall be determined by run up or pulse method. Clearing times should be within four (4) cycles or less. All trip times shall fall within NETA Table values. Instantaneous pickup current levels should be within 20% of manufacturer's published values. Certification stickers, listing date and company who performed the tests, shall be attached to the inside of the breaker compartment door right after the breaker has passed all tests.
- 3) Contact and Insulation Resistance: Contact resistance shall be measured and be compared to adjacent poles and similar breaker. Deviations of more than 50% shall be reported to Engineer. Insulation resistance shall be measured and shall not be less than 50 megohms.
- 4) At end of test the all breakers trip settings shall be set by Contractor to values listed in protective device coordination study to properly protect equipment.
- 5) The Contractor shall fill in Breaker Test Form TF9 located in Appendix "A."

5. POST ENERGIZATION TESTS

a. PANELS AND ENCLOSURE TESTS

- 1) During these tests, test all local and remote control operations and interlocks.
- 2) Electrical Tests:
- 3) Perform operational tests by initiating control devices to affect proper operation.
- 4) The Contractor shall fill in Operational Device Checks and Tests Form TF6.

b. PHASE ROTATION TESTS

- 1) Check connections to all equipment for proper phase relationship. During this test, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence. Three phase equipment shall be tested for the phase sequence "ABC" front to back, left to right, and top to bottom.
- 2) All three phase motors shall be tested for proper phase rotation. Revise wire color codes to indicate correct phase color if wires are swapped.
- 3) The Contractor shall fill in Phase Rotation Test Form TF7 located in Appendix "A."

c. MOTOR TESTING

- 1) Record the amperage draw on all phases of each motor operating under full load. Ensure that these values do not exceed the motor nameplate full load amperage.
- 2) Record the voltage between all phases of each motor operating under full load. If the voltage balance is not within plus or minus 5 percent of nominal, request the Utility power company or other responsible party to correct the problem.
- 3) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form and be placed in the O&M manual:
  - a) Equipment driven.
  - b) Motor horsepower.
  - c) Nameplate amperes.
  - d) Service factor.

- e) Temperature rating.
  - f) Overload catalog number.
  - g) Overload current range and setting.
  - h) Circuit breaker rating.
  - i) Circuit breaker trip setting, for magnetic only circuit breakers.
- 4) The Contractor shall fill in Motor Test Form TF10, located in Appendix "A."
  - 5) Additional motor testing requirements per Section 11312.

d. INSTRUMENTATION TESTS

- 1) The Contractor shall provide a minimum of two (2) hours of field acceptance testing for each instrument. If any instrument has not been fully tested during its allotted time, the Contractor shall provide additional hours for finishing testing of the instrument, to be paid by the Contractor.
- 2) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.
  - a) As a minimum, all the tests indicated/specified on the test form TF14 in Appendix "A" shall be performed by the Contractor for each of the instruments listed in Appendix "B" Device Index.
- 3) Test equipment used for testing shall be of suitable quality so as not to mask performance deficiencies. All test equipment shall be traceable to National Bureau of Standards and have been calibrated within six months of test date.
- 4) Testing shall be accomplished using simulated inputs only with prior written approval of the Owner.
- 5) Calibration stickers shall be supplied for all equipment and instruments. Calibration stickers shall list the following information:
  - a) Tag number.
  - b) Calibrated by who (name), firm, city and telephone number.
  - c) Date calibrated.
  - d) Calibration range.
  - e) Comments.

e. CONTROL SYSTEM TESTS

- 1) All the controls shall be tested by the Owner's & system supplier with assistance from Contractor in the field for proper operation of alarms, status, analog, control, autodialer and display functions, etc. Where practical, the final element shall be used, i.e. trip the intrusion switch or change levels. Testing shall be accomplished using simulated inputs only when necessary.
- 2) During this task the System supplier shall have:
  - a) Qualified field technician with experience in the startup of similar systems with pump controls, and other field devices.
  - b) Test instruments as required.
  - c) A pair of radios for communication.

6. TRIAL OPERATIONS:

- a. The entire electrical installation shall be either tested or trial operated to verify Contract compliance. That is, controls, heaters, fans, light switches, convenience receptacles, lights, etc. shall be trial operated. Contractor shall conduct trial operations in the presence of the Engineer and Operations and Maintenance personnel.

F. OPERATIONAL TESTING

1. After all the previous tests in this subsection are complete, the Contractor shall conduct operational testing.
2. The Contractor shall demonstrate operation of each part of the control and instrumentation system to the satisfaction of the Owner and/or Engineer. Tests shall be repeated by the Contractor at no additional cost to the Owner and at the discretion of the Owner and/or Engineer to resolve whether the system has been demonstrated that it will operate under all modes of operations and varying conditions.
3. For the operational testing the new equipment shall be activated to automatically run for 5 days, Monday through Friday 24 hours a day. During this five day period the Owner will run the different combinations of the pump control options. If equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5-day operational test, Monday through Friday 24 hours a day. This shall be continued until the new equipment functions acceptably for 5 consecutive days.



4. The Electrical Contractor, testing firm and System Supplier shall re-visit the jobsite as often as necessary until all field tests, start-up and operation tests are completed and approved.

### 3.9 OPERATION AND MAINTENANCE MANUALS

- A. Four (4) sets of operating manuals covering instruction and maintenance on each type of equipment shall be furnished prior to completion of the project.
- B. These instructions shall provide the following as a minimum:
  1. Each set bound in a three ring binder and organized as specified herein.
  2. "A complete "Record" set of favorably reviewed electrical submittals as provided under SUBMITTAL AND DRAWING REQUIREMENTS.
  3. As-built one-line, elevation, loop, elementary and interconnection drawings with all field changes included.
  4. A complete list of the equipment supplied, including serial numbers, ranges, options, and pertinent data necessary for ordering replacement parts.
  5. Full, technical specifications on each item.
  6. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts list with stock numbers shall be provided on the components that make up the assembly.
  7. Record of each motor nameplate data including manufacturer, full part number, size, voltage, amps, service factor, bearings, etc.
  8. Record of each breaker and overload heater element including manufacturer, full part number, size, setting etc.
  9. Safety precautions and procedures.
  10. Special maintenance requirements particular to this system shall be clearly defined, along with calibration and test procedures.
  11. Spread sheet listing all setpoints and programmable parameters entered for this project for VFD, UPS, HIM, etc.
  12. Include all completed and signed test data and forms from factory and field testing.
  13. No photo copies are allowed of standard published manuals available from manufacturers, such as for the RTU. All of the manuals shall be originals.

14. All of these sets of O & M Manuals shall be made up of "original" (no copies, PDFs or reproductions) documents. No photo or fax copies are allowed of standard published manuals available from Manufacturers.
  15. Warranty certificate with start dates, duration and contact information.
  16. Troubleshooting instructions.
  17. Record of all settings or parameters for all programmable devices.
- C. At the end of the project these manuals shall be updated to show "as-built or as-installed" conditions.
- D. Provide to the Owner two sets of CDs (CDs shall contain all documents in both PDF format and unlocked AutoCAD (DWG format, version 2010 or later)):
1. As-built Contract electrical and instrumentation drawings prepared for this project.
  2. As-built set of all required Drawings per Section 16011 for the project.
  3. As-built sets of other computer generated documents prepared for this project, including Bill of Materials prepared for this project.
  4. Electronic PDF version of O&M manual. Version format shall follow the hard copy submittal of the O&M, including index, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. PDF shall "bookmarked" to at each index and subtab listed in O&M.
  5. These disks shall be the property of the Owner, for its use on this and future projects.

### 3.10 TRAINING

- A. All training sessions shall be held on dates and times agreeable to Owner. A total of 5 or less Owner personnel shall be trained.
- B. After Operation Testing has started the Contractor shall provide a period of not less than 8 hours training for instruction of operation and maintenance personnel in the use of all the new electrical, control and instrumentation systems. The Contractor shall make necessary arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.
- C. Training to include instruction on the use, operation, calibration, programming, and maintenance of the field devices listed in Appendix "B."
- D. Acceptable Operation and Maintenance Manuals shall be on site and available when training sessions are implemented.

### 3.11 SPARE PARTS

- A. The Contractor shall supply all spare parts prior to start of field tests. All parts shall be sealed in plastic bags and delivered to the site in a heavy duty plastic storage bag. Bag shall be clearly labeled with part name and number and the corresponding equipment tagname.
- B. The Contractor shall make available any replacement parts that are not manufacturer's normal stock items for immediate service and repair of all the instrumentation equipment throughout the warranty period.
- C. The following spare parts shall be provided to the Owner as part of this Contract:
  - 1. Five (5) fuses for each type of fuse.
  - 2. Twenty (20) lamps for each type of light.
  - 3. Two (2) relays for each type of control, power fail and time delay relay.
- D. See other Division 16 sections for additional spare parts to be provided.

### 3.12 WARRANTY

- A. The Contractor shall warrant all electrical and instrumentation equipment for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.
- B. The Contractor shall have a staff of experienced personnel available to provide service on 2 working days notice during the warranty period. Such personnel shall be capable of fully testing and diagnosing the hardware and software and implementing corrective measures.
- C. If the Contractor fails to respond in 2 working days, the Owner at its option will proceed to have the warranty work completed by other resources; the total cost for these other resources shall be reimbursed in full by the Contractor. "Fail to respond" shall be defined as: The Contractor has not shown a good faith effort and has not expended adequate resources to correct the problem. The use of other resources, as stated above, shall not relieve or change the Contractor from fulfilling the remainder of the warranty requirements.
- D. The Contractor shall reimburse Owner for all direct and indirect costs associated with Owner repairs.
- E. Prior to "final acceptance," the Contractor shall furnish to the Engineer a listing of warranty information for all manufacturers of materials, instruments, and equipment used on the project. The listing shall include the following:
  - 1. Manufacturer's name, service contact person, phone number, and address.

2. Material and equipment description, equipment number, part number, serial number, and model number.
  3. Manufacturer's warranty expiration date.
- F. The Contractor shall provide all labor and material to troubleshoot, program, replace, or repair any hardware or software that fails or operates unpredictably during the warranty period, at no additional cost to the Owner.
- G. Each time the Supplier's repair person responds to a system malfunction during the warranty period, he or she must contact the designated Owner maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction Owner staff. Owner reserves the right at its sole discretion to deny operations requested by the Supplier. A written description of all warranty work performed shall be documented on a field service report to be given to Owner prior to the repair person leaving job site. This field service report shall detail and clearly state problem, corrective actions taken, additional work that needs to be done, date, repair person name and company.

### 3.13 FINAL ACCEPTANCE

- A. Final acceptance will be given by the Owner after the equipment has passed the "operational testing trial period", each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.
- B. Upon completion of the project, prior to final acceptance, remove all temporary services, equipment, material, and wiring from the site.
- C. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall provide the following to the Owner:
1. Listing of warranty information.
  2. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.
  3. Two (2) CD disk copies of all final documentation to reflect as-built conditions.
- D. Prior to final acceptance submit each key with matching duplicate. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.

## APPENDIX "A"

### TEST FORMS

#### Index of Forms:

Bill of Material

Schedule Test Request Form

TF1 Power and Control Conductor Test Form

TF2 Instrumentation Conductor Test Form

TF3 Grounding System Test Form

TF4 Visual and Mechanical Inspection Form

TF5 Panelboard Test Form

TF6 Operational Device Checks and Tests Form

TF7 Phase Rotation Test Form

TF9 Breaker Device Test Form

TF10 Motor Test Form

TF11 Factory Test Checkout Form

TF14 Instrument Data Sheet and Calibration Record



## SCHEDULED TEST REQUEST FORM

COMPANY PERFORMING TEST: \_\_\_\_\_  
TESTING PERSONNEL : \_\_\_\_\_  
PHONE NUMBER OF COMPANY: \_\_\_\_\_  
TEST PROCEDURE SUBMITTAL: \_\_\_\_\_ APPROVED : \_\_\_/\_\_\_/\_\_\_  
SCHEDULED TEST DATE : \_\_\_\_\_ DATE : \_\_\_/\_\_\_/\_\_\_

TIME	DESCRIPTION OF TEST
8:00	
9:00	
10:00	
11:00	
12:00	
13:00	
14:00	
15:00	
16:00	

NOTES:

TESTED BY : \_\_\_\_\_ DATE : \_\_\_/\_\_\_/\_\_\_  
WITNESSED BY: \_\_\_\_\_









# VISUAL AND MECHANICAL INSPECTION FORM

## TEST FORM (TF4)

**EQUIPMENT**

NAME : \_\_\_\_\_ LOCATION : \_\_\_\_\_

NAMEPLATE DATA

MFGR. : _____	SERIES # : _____
MODEL # : _____	U.L. # : _____
VOLTAGE : _____	PHASE : _____
AMPERAGE : _____	SERVICE : _____
BUS TYPE : _____	BUS BRACING: _____
VERT. BUS : _____	HORZ. BUS : _____
GND. BUS : _____	NEU. BUS : _____
ENCLOSURE : _____	_____
_____	_____

**INSPECTION CHECK LIST**

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

- TIGHTEN ALL BOLTS AND SCREWS \_\_\_\_\_
- TIGHTEN ALL WIRING AND BUS CONNECTIONS \_\_\_\_\_
- VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING \_\_\_\_\_
- CHECK BUS BRACING AND CLEARANCE \_\_\_\_\_
- CHECK MAIN GROUNDING CONNECTION AND SIZE \_\_\_\_\_
- INSPECT GROUND BUS BONDING \_\_\_\_\_
- CHECK EQUIPMENT GROUNDS \_\_\_\_\_
- CHECK CONDUIT GROUNDS AND BUSHINGS \_\_\_\_\_
- INSPECT NEUTRAL BUS AND CONNECTIONS \_\_\_\_\_
- CHECK HEATERS AND THERMOSTATS \_\_\_\_\_
- CHECK VENTILATION AND FILTERS \_\_\_\_\_
- CHECK FOR BROKEN OR DAMAGED DEVICES \_\_\_\_\_
- CHECK DOOR AND PANEL ALIGNMENT \_\_\_\_\_
- INSPECT ANCHORAGE \_\_\_\_\_
- CHECK FOR PROPER CLEARANCES AND WORKING SPACE \_\_\_\_\_
- REMOVE ALL DIRT AND DUST ACCUMULATION \_\_\_\_\_
- INSPECT ALL PAINT SURFACES \_\_\_\_\_
- CHECK FOR PROPER WIRE COLOR CODES \_\_\_\_\_
- INSPECT ALL WIRING FOR WIRE LABELS \_\_\_\_\_
- CHECK FOR PROPER WIRE TERMINATIONS \_\_\_\_\_
- CHECK FOR PROPER WIRE SIZES \_\_\_\_\_
- INSPECT ALL DEVICES FOR NAMEPLATES \_\_\_\_\_
- CHECK IF DRAWINGS MATCH EQUIPMENT \_\_\_\_\_
- CHECK ACCURACY OF OPERATION & MAINTENANCE \_\_\_\_\_
- \_\_\_\_\_

TESTED BY : \_\_\_\_\_  
 WITNESSED BY: \_\_\_\_\_

DATE : \_\_\_/\_\_\_/\_\_\_

## PANEL-BOARD TEST FORM

### TEST FORM (TF5)

PANEL NAME: \_\_\_\_\_ LOCATION : \_\_\_\_\_

#### NAMEPLATE DATA

MFGR. : _____	SERIES # : _____
MODEL # : _____	U.L. # : _____
VOLTAGE : _____	PHASE : _____
AMPERAGE : _____	SERVICE : _____
BUS TYPE : _____	BUS BRACING: _____
VERT. BUS : _____	HORZ. BUS : _____
GND. BUS : _____	NEU. BUS : _____
ENCLOSURE : _____	MAIN BKR : _____

#### INSULATION RESISTANCE TESTS - MEGOHMS

A-GND	B-GND	C-GND	

#### INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

- TIGHTEN ALL BOLTS AND SCREWS \_\_\_\_\_
- TIGHTEN ALL WIRING AND BUS CONNECTIONS \_\_\_\_\_
- VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING \_\_\_\_\_
- CHECK BUS BRACING AND CLEARANCE \_\_\_\_\_
- CHECK MAIN GROUNDING CONNECTION AND SIZE \_\_\_\_\_
- INSPECT GROUND BUS BONDING \_\_\_\_\_
- CHECK EQUIPMENT GROUNDS \_\_\_\_\_
- CHECK CONDUIT GROUNDS AND BUSHINGS \_\_\_\_\_
- INSPECT NEUTRAL BUS AND CONNECTIONS \_\_\_\_\_
- CHECK FOR BROKEN OR DAMAGED DEVICES \_\_\_\_\_
- CHECK DOOR AND PANEL ALIGNMENT \_\_\_\_\_
- INSPECT ANCHORAGE \_\_\_\_\_
- CHECK FOR PROPER CLEARANCES AND WORKING SPACE \_\_\_\_\_
- REMOVE ALL DIRT AND DUST ACCUMULATION \_\_\_\_\_
- INSPECT ALL PAINT SURFACES \_\_\_\_\_
- CHECK FOR PROPER WIRE COLOR CODES \_\_\_\_\_
- INSPECT ALL WIRING FOR WIRE LABELS \_\_\_\_\_
- CHECK FOR PROPER WIRE TERMINATIONS \_\_\_\_\_
- CHECK FOR PROPER WIRE SIZES \_\_\_\_\_
- INSPECT ALL DEVICES FOR PROPER LEGEND NAMEPLATES \_\_\_\_\_

CALIBRATION TEST EQUIPMENT PART NO. \_\_\_\_\_

DATE CALIBRATED: \_\_\_\_\_

TESTED BY : \_\_\_\_\_

DATE : \_\_\_/\_\_\_/\_\_\_

WITNESSED BY: \_\_\_\_\_







## MOTOR TEST FORM

### TEST FORM (TF10)

EQUIPMENT

NUMBER : \_\_\_\_\_ NAME : \_\_\_\_\_

#### NAMEPLATE DATA - FIELD RECORDED

MANUFACTURER		MODEL #		SERIAL #		FRAME #	
H.P.	R.P.M	F.L.A	VOLTS	PHASE	FREQ.	P.F.	S.F.
CODE	N.E.M.A.	INSUL.	ENCLOS.R.	DUTY	DESIGN		

INSULATION TESTS PHASE TO GROUND MEG-OHMS			MOTOR FRAME GROUNDING SYSTEM TEST			MOTOR HEATER	MOTOR THERMAL
A	B	C	APPLIED VOLTS	MEAS. AMPS	CALC. OHMS	MEAS. AMPS	TRIP TEST

#### MOTOR TESTS - MEASURED VALUES

AMPERAGE			VOLTAGE			POWER FACTOR	WATTAGE
A	B	C	AB	BC	CA		

NOTES:

VOLTAGE, AMPERAGE, POWER FACTOR, & WATTAGE SHALL BE RECORDED WITH A TRUE RMS METER.

TESTED BY : \_\_\_\_\_

DATE : \_\_\_/\_\_\_/\_\_\_

WITNESSED BY: \_\_\_\_\_



**FACTORY TEST  
MCC/CONTROL PANEL CHECKOUT FORM (TF11)**

**Manufacturer:** \_\_\_\_\_ **Location:** \_\_\_\_\_  
**Job No.:** \_\_\_\_\_  
**Tel:** \_\_\_\_\_ **Fax:** \_\_\_\_\_

**MCC / Control Panel:** \_\_\_\_\_ **TEST RESULT**

**OVERALL PANEL INSPECTION**

	<b><u>Pass</u></b>	<b><u>Fail</u></b>
1. All front panel and back panel components mounted securely.....	<input type="checkbox"/>	<input type="checkbox"/>
2. All wiring terminated and labeled correctly.....	<input type="checkbox"/>	<input type="checkbox"/>
3. All components, wiring, and labeling accurately reflected on the drawings..	<input type="checkbox"/>	<input type="checkbox"/>

**POWER-UP INSPECTION**

1. Voltage levels on load side of circuit breakers.....	<input type="checkbox"/>	<input type="checkbox"/>
2. Voltage levels at the DC terminals of the power supply.....	<input type="checkbox"/>	<input type="checkbox"/>
3. Voltage levels at the DC power distribution terminals.....	<input type="checkbox"/>	<input type="checkbox"/>

**POWER DISTRIBUTION AND GENERAL COMPONENT TESTING**

1. Power distribution to the appropriate components.....	<input type="checkbox"/>	<input type="checkbox"/>
2. Operation of the ancillary components such as receptacles, work lights, etc.	<input type="checkbox"/>	<input type="checkbox"/>

**CONTROL COMPONENTS CHECKS**

1. Operators (push buttons, selector switches, pilot lights).....	<input type="checkbox"/>	<input type="checkbox"/>
2. Inputs from External Sources.....	<input type="checkbox"/>	<input type="checkbox"/>
3. Outputs to External Sources.....	<input type="checkbox"/>	<input type="checkbox"/>
4. Relay Logic.....	<input type="checkbox"/>	<input type="checkbox"/>
5. PLC I/O and Program Verification.....	<input type="checkbox"/>	<input type="checkbox"/>
6. O/I Display Verification.....	<input type="checkbox"/>	<input type="checkbox"/>

**Notes:**

1. For relay logic checks, each rung of the elementary or loop diagram is to be highlighted in yellow as they are verified for correct control functions.
2. For PLC I/O and program verification, the control strategies shall be highlighted in yellow as each logic function is tested.

**Tested by:** \_\_\_\_\_ **Witnessed by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_



**APPENDIX "B"**

**DEVICE INDEX**

### Section 16010 - DEVICE INDEX

P&ID	TAG	NO.	DESCRIPTION	TYPE	SPECIFICATION	MINIMUM NEMA RATING	SIZE	VOLT	SP / RANGE	UNITS	DWG REF DET MOUNTING	NOTES AND ACCESSORIES	16010 TEST FORM
I2	LSHH	151	Level Switch	Float	16010-2.12.A	-	-	24VDC		FT	E12-C		TF14
I2	LSH	151	Level Switch	Float	16010-2.12.A	-	-	24VDC		FT	E12-C		TF14
I2	LSL	151	Level Switch	Float	16010-2.12.A	-	-	24VDC		FT	E12-C		TF14
I2	PI	161	Pressure Indicator	Gauge	DWG C03.01	-	-	-		PSI			TF14

**\*\*END OF SECTION\*\***

**SECTION 16605**  
**ELECTRICAL SYSTEM ANALYSIS**

**PART 1 - GENERAL**

**1.1 SUBMITTALS**

- A. Provide the following submittals, per Section 16010, for the electrical power system including the 240/120V distribution system:
  - 1. Short Circuit Study.
  - 2. Coordination.
  - 3. Arc Flash Study.
- B. Short Circuit, Coordination and Arc Flash Studies shall be prepared, stamped and signed by a professional Electrical Engineer registered in the State of California and in accordance with IEEE 242, IEEE 399 ANSI/IEEE C37.13 and IEEE 519.
- C. Exceptions / Clarifications
  - 1. Itemize all exceptions and clarifications to the Contract Documents in a letter (located in the front of the submittal) on company letterhead.
  - 2. Exceptions that are noted in the study, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.
  - 3. All exceptions taken from the Drawings and specifications shall be documented with justifications. When noting the exception, list which Drawings or which Specification Subsection number the exception is taken.
  - 4. Clarification requests shall list which Drawing or Specification Subsection number the clarification is required for.

**1.2 SEQUENCING AND SCHEDULING**

- A. It is the responsibility of those performing the electrical system analysis to collect and field verify all data. This includes obtaining all data from the serving Utility for this project.
- B. Meter/main and panelboard equipment shall not be delivered until Protective Device Coordination Study has been submitted and approved.
- C. A complete Protective Device Coordination Study shall be submitted within 60 days after approval of Short Circuit Study.

- D. The Short Circuit, Protective Device Coordination and Arc Flash Studies shall be updated prior to Project Completion. Utilize characteristics of as-installed equipment and materials. The protective device coordination study shall be submitted and approved prior to start of field breaker tests per Section 16010.
- E. It is the Contractor's responsibility to obtain the required information from the Utility Company and vendors necessary for completing the required studies.

## PART 2 - MATERIALS

### 2.1 GENERAL

- A. Equipment and component titles and numbers used in the Studies shall be identical to the equipment and component titles and numbers shown on the Drawings.
- B. Perform Studies using PC based computer software. State program name and version (e.g. version 2.1) in report.
- C. Perform complete fault calculations for Utility source. Equipment shall not be grouped as a single large load; they shall be treated as individual loads.
- D. Utilize proposed load data for the Study obtained from submittals, Utility Company and field verifications.
- E. Complete protective device coordination study listing all device settings shall be utilized during start-up of electrical equipment.
- F. It is the Contractor's responsibility to obtain the required information from the Utility Company, Generator supplier and vendors necessary for completing the requested studies.

### 2.2 SHORT CIRCUIT STUDY

- A. Short Circuit Study Content:
  - 1. Provide unique page numbers for every sheet in Study. Unique page numbers to be manually placed by Study Company after printout if study report doesn't assign page numbers.
- B. Include the following in the short circuit study:
  - 1. Cable impedances based on copper conductors.
  - 2. Bus impedances based on copper bus bars.
  - 3. Transformer impedances based on tolerances specified in ANSI C57.12.00.
  - 4. Source data (i.e. cable lengths, sizes, and quantity, for all runs in study, listing of bus loads, etc).
  - 5. Utility data:
    - a. Size of Utility transformer.
    - b. Impedance of Utility transformer.
    - c. Primary voltage of Utility transformer.



- d. Fault information on primary side of Utility transformer:
    - 1) Three-phase bolted fault.
    - 2) X/R ratio (positive sequence).
    - 3) Line to ground fault.
    - 4) X/R ratio (zero sequence).
  - e. Protective relays (type & settings).
6. Voltage drop and current flow at each node and load in system.
- C. Calculate Short Circuit interrupting duties for an assumed three-phase bolted fault and line-to-ground fault at each of the following locations:
- 1. Motor Panel.
  - 2. New panelboard.
  - 3. New 240/120V equipment.
- D. Verify:
- 1. Equipment and protective devices are applied within their ratings.
  - 2. Adequacy of panelboard bus bars to withstand Short Circuit stresses.
  - 3. Adequacy of transformer windings to withstand Short Circuit stresses and over-current.
  - 4. Cable sizes for ability to withstand normal and fault load currents.
- E. Provide the following in the Short Circuit study report:
- 1. Calculation methods and assumptions.
  - 2. Input data.
  - 3. Short circuit data.
    - a. Impedances.
    - b. X to R ratios.
    - c. Asymmetry factors.
    - d. Motor contributions.
    - e. Short Circuit kVA.
    - f. Symmetrical and asymmetrical line-to-line and line-to-ground fault currents.
    - g. Device evaluation including rating of equipment.
    - h. Bus evaluation including rating of equipment.
    - i. Source data, from Electric Utility Company.

4. Tabulations of calculated quantities.
5. Results, conclusions, and recommendations.
6. One line diagram of distribution system
7. Impedance diagram showing the resistances and reactances for all cables of the distribution system.
8. Two studies (minimum) – one for worst case scenario and one for actual equipment operating.
9. Calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume the minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the Utility and shall assume motors to be operating under full-load conditions. The Study shall also calculate the fault current using in-rush current values.

## 2.3 PROTECTIVE DEVICE COORDINATION STUDY

- A. Provide Protective Device Coordination drawings for each section of distribution system that includes the following:
  1. Graphically diagram displaying coordination time-current curves on conventional log-log curve sheets. Each time-current curve shall have a unique identifier label. This identifier shall be used in the tabulated settings spreadsheet and on the associated one-line diagram.
  2. Time-current curves shall include the following curves (minimum):
    - a. Utility relays (phase & ground) and high voltage switchgear relays (phase and ground).
    - b. All upstream protective devices and breakers.
    - c. All MCP breaker and associated motor or equipment load. Duplicates of the same sized protective device and motor size may be omitted (i.e., when there are 3 pumps for same application).
    - d. All transformers and associated primary and secondary protection.
    - e. Unique identifier for each protective device.
  3. One-line diagram that applies to specific portion of distribution system associated with time-current curves. One-line diagram shall include the following:
    - a. Location of each device.

- b. Power and voltage ratings, primary and secondary transformers amperages.
- c. All significant circuit elements such as transformers, cables, breakers, fuses, relays, etc. with their corresponding amperage ratings.
- d. Tag of each branch and node (shall be the same tags used in short circuit study).
- e. English description, equipment name, HP, and full load amp rating of motors and other 3 phase loads.
- f. Terminate device characteristic curves at a point reflecting maximum fault current to which device is exposed as calculated in short circuit study.

B. Characteristics plotted on time current curves shall include:

- 1. Protective current relays.
- 2. Fuses including manufacturer's minimum melts, total clearing, tolerance, and damage bands.
- 3. Circuit breaker trip devices, including manufacturer's tolerance bands.
- 4. Transformer full-load currents at 100% and 600%.
- 5. Motor and equipment full load currents.
- 6. Transformer magnetizing inrush currents.
- 7. Transformer damage curves.
- 8. ANSI transformer withstand parameters.
- 9. Fault currents.
- 10. Ground fault protective device settings.
- 11. Other electronic protective devices.

C. Provide the following recommended settings in spreadsheet format in the Protective Device Coordination study report:

- 1. Relay settings including CT values.
- 2. Circuit Breakers adjustments:
  - a. Long Delay Pickup and Time.
  - b. Short Time Pickup and Time.

- c. Instantaneous Pickup and Time.
- d. Ground Pickup and Time.
3. Programmable settings for all electronic devices. Settings for non-current relay settings shall also be provided.
4. Settings shall be given both in amps and seconds as well as the corresponding physical setting (i.e. 30A and setting B on MCP) for device.
5. Identify protective device associated with each curve by manufacturer type, function and part number.

## 2.4 ARC FLASH HAZARD STUDY

### A. General:

1. Arc flash boundary and incident energy shall be calculated using a PC computer program at all significant locations in the electrical network, including panelboards, transformers, and other major equipment where work could be performed on energized equipment.
2. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

### B. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm<sup>2</sup>.

### C. Study shall include the following:

1. All significant locations in 240 volt and 120 volt systems fed from transformers equal to or greater than 125 kVA.
2. Incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report.
3. Provide the following incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report (values shall be calculated for all electrical equipment in the power distribution system):
  - a. Arcing fault magnitude
  - b. Device clearing time
  - c. Duration of arc
  - d. Boundary for:
    - 1) Arc flash limited shock approach

- 2) Limited shock approach
- 3) Restricted shock approach
- 4) Prohibited shock approach
- e. Working distance
- f. Personal Protective Equipment Levels
- g. Incident energy at 18 inches (in cal/sq-cm)
- h. Hazard Risk Category
- i. Recommendations for arc flash energy reduction for each location having more than 8 cal/sq-cm. Provide preliminary cost estimate for implementing recommendations.
- 4. Provide recommendations for the Personal Protective Equipment (PPE) that the Owner should maintain on site for the level of hazard.
- 5. Provide recommendations for safety label design that should be posted on electrical equipment.

2.5 STUDY REPORTS

- A. Written reports submitted for approval shall contain:
  - 1. Scope of Studies performed.
  - 2. Explanation of bus and branch numbering system.
  - 3. Report calculations, tabulations and spreadsheets.
  - 4. Selected equipment deficiencies.
  - 5. Results of Short Circuit & Arc Flash Studies.
  - 6. Comments, recommendations or suggestions regarding:
    - a. Changes and additions to equipment rating and/or characteristics.
    - b. Circuit protective devices improperly rated for overload or fault conditions.
    - c. Arc Flash protective equipment and safety labels.
  - 7. Tabulation spreadsheet for all protective device settings with the following column entries (minimum):

Device Code	Description	MFR	Type	Plug Trip	Frame	KAIC	Long Time		Short Time		Inst Amps	Ground	
							Amps	Time	Amps	Time		Amps	Time

8. Stamped, signed and dated by Electrical Engineer registered in the State of California who performed the analysis.
- B. Reports are to be updated to reflect as-built conditions and placed in O&M manual, per Section 16010 requirements.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Make minor modifications to equipment settings as required to accomplish conformance with the Short Circuit and Arc Flash Studies.
- B. Notify Engineer in writing of any required major equipment modifications.
- C. Provide two (2) CDs at the completion of the project. One CD shall contain the as-built set of studies, reports, settings, and other pertinent information. The other CD will contain the original source format of input data used for the PC based computer software. Provide all setup information used for the computer based study and report.

### 3.2 FIELD TESTS

- A. Provide field testing of protective equipment.
- B. Adjust relay and protective device settings according to values established by Coordination Study.

### 3.3 ARC FLASH WARNING LABELS

- A. All Arc Flash warning labels shall meet NEC requirements, OSHA standards and NFPA recommendations.
- B. Provide and install 3.5 in. x 5 in. thermal transfer type labels of high adhesion polyester for each work location analyzed and as required by the NEC for flash protection on power distribution equipment.
- C. Each label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following machine printed information:
  - 1. Location designation
  - 2. Nominal voltage
  - 3. Flash protection boundary
  - 4. Hazard risk category
  - 5. Incident energy
  - 6. Working distance
  - 7. Engineering report number, revision number and issue date
- D. Labels shall not be hand labeled.

- E. For all areas, Contractor shall post the following:
  - 1. Required PPE levels
  - 2. Working distances
  - 3. Shock hazard voltage
  - 4. Shock Approach Boundaries:
    - a. Limited
    - b. Restricted
    - c. Prohibited
  
- F. Provide Arc Flash labels for the each of the following pieces of equipment:
  - 1. 240/120V panelboards
  - 2. Control Panels
  - 3. Electrical Panels
  - 4. All electrical equipment with an incident energy level greater than 1.2 Cal/cm<sup>2</sup>.
  
- G. Labels shall be submitted for approval. No labels shall be installed without prior approval by Owner or Owner representative.

### 3.4 ARC FLASH TRAINING

- A. The Supplier shall train Owner personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures shall be in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces and shall be provided in the equipment manuals.

**\*\*END OF SECTION\*\***





BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

June 12, 2014

Napa County Regional Park and Open Space District  
Chris Cahill, Principal Planner  
1195 Third Street, Second Floor  
Napa, California 94558

**RECEIVED**  
JUN 23 2014  
Napa County Planning Building  
& Environmental Services

**Re: ADMP RIN # NOA-0091**  
**Project: Camp Berryessa Improvement Project, 7850 Berryessa-Knoxville Road, Napa CA 94558**  
**Applicant: Napa County Regional Park and Open Space District**

Dear Mr. Cahill,

This letter is in response to the Asbestos Dust Mitigation Plan ("ADMP") referenced above for the subject project submitted to the Bay Area Air Quality Management District ("District") by the Napa County Regional Park and Open Space District, pursuant to subsection (e)(2)(A) of the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations, Section 93105, Title 17, California Code of Regulation ("Asbestos ATCM").

The District received the revised ADMP on June 3, 2014. The reference identification number ("RIN") for this ADMP is **NOA-0091**; when making inquiries or filing record submittals regarding this ADMP, please refer to the RIN.

District staff has completed the review of the revised ADMP on June 12, 2014 and determined the ADMP meets the applicable criteria pursuant to subsection (e)(4) of the Asbestos ATCM, provided the Dust Mitigation Measures enumerated in the following sub-sections are adhered to throughout the duration of construction and/or grading activities at the project:

- 2.1 Track-Out Prevention and Control Measures
- 2.2 Control Measures for Disturbed Surfaces and Storage Piles
- 2.3 Control Measures for Staging Areas Access Roads
- 2.4 Control Measures for Earthmoving Activities
- 2.5 Control Measures for Off-Site Transport
- 3.0 Post-Construction Mitigation

In addition, approval is subject to the requirements set forth below:

Startup notification:

- The applicant shall submit electronic notification at least one week prior to beginning construction and/or grading activities at the project site to [Compliance@baaqmd.gov](mailto:Compliance@baaqmd.gov) (identifying the project RIN # in the Subject of email).

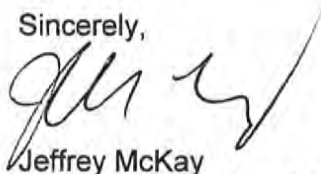
This ADMP is the basis for compliance with the Asbestos ATCM for the Camp Berryessa Improvement Project located in Napa, California, and its terms must be implemented throughout the duration of the construction project. At the conclusion of the project, a letter stating the final date of work and detailing the post construction stabilization activities shall be submitted to Compliance and Enforcement at:

Director of Enforcement  
939 Ellis St., San Francisco, CA 94109

Letter to Chris Cahill  
June 12, 2014  
Page 2

Any questions you may have regarding this ADMP should be directed to Kevin Vo,  
Air Quality Specialist II, at (415) 749-8620.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jeffrey McKay', with a stylized flourish extending to the right.

Jeffrey McKay  
Deputy Air Pollution Control Officer

Enclosure: Asbestos Dust Mitigation Plan- 901 Rankin Street, SF CA



**BAY AREA AIR QUALITY MANAGEMENT DISTRICT**  
 939 Ellis Street  
 San Francisco, California 94109  
 (415) 771-6000

For District Use Only	
Date Rec'd	
File #	

## ASBESTOS AIRBORNE TOXIC CONTROL MEASURE FOR CONSTRUCTION AND GRADING OPERATIONS

§ 93105, Title 17, California Code of Regulations

# ASBESTOS DUST MITIGATION PLAN APPLICATION

### 1. Company and Project Information

Company Name and Address		Project Location	
Name	Napa County Regional Park and Open Space District	Location	Camp Berryessa - Lake Berryessa
Address	1195 Third Street, Second Floor	Address	7850Berryessa-Knoxville Rd
City/State	Napa, Calif.	Zip	94559
City/State	Napa, Calif.	Zip	94558
Contact	Chris Cahill	Start Date:	June 1, 2014
Phone	707-299-1335	Fax	707-299-4285
		Estimated Completion Date:	December 31, 2014

The following information is requested to assist in the evaluation of your Asbestos Dust Mitigation Plan. Omission of this information may result in a delay of the completion of the evaluation and approval of the plan. Please provide the information requested below; place a checkmark in front of each of the categories that applies.

### 2. Detailed Project Information

**Type of Project:** (Check all that applies)

<input type="checkbox"/> Road or Railway Construction	<input checked="" type="checkbox"/> Trenching / Utilities Work
<input checked="" type="checkbox"/> Road Maintenance	<input checked="" type="checkbox"/> Other (please describe)
<input type="checkbox"/> Housing Development	Construct Youth Camp
<input type="checkbox"/> Commercial Property Development	_____

### 3. Detailed Site Information

**Areas and Facilities within a quarter mile (400 meters) of the Project:** (Check all that applies)

<input type="checkbox"/> Residential	<input type="checkbox"/> Hospital / Nursing Home	<input checked="" type="checkbox"/> Other (please describe)
<input type="checkbox"/> Commercial	<input type="checkbox"/> School	
<input type="checkbox"/> Industrial	<input type="checkbox"/> Park / Playground	
<input checked="" type="checkbox"/> Rural		

# ASBESTOS DUST MITIGATION PLAN APPLICATION

BAY AREA AIR QUALITY MANAGEMENT DISTRICT 939 Ellis Street, San Francisco, CA 93109

## 4. Addition Information

The following information **MUST** be included:

Map(s) clearly indicating:

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Property lines / boundaries   | <input checked="" type="checkbox"/> Storage areas / piles     |
| <input checked="" type="checkbox"/> Rights of way / easements     | <input checked="" type="checkbox"/> Track-out control         |
| <input checked="" type="checkbox"/> Areas to be cleared or graded | <input checked="" type="checkbox"/> Staging areas for removal |
| <input checked="" type="checkbox"/> Trenching areas               | <input checked="" type="checkbox"/> Truck routes              |
| <input checked="" type="checkbox"/> Excavation sites              | <input checked="" type="checkbox"/> On-site parking lots      |

If available, please attach the following information:

- Geologic Information
- Topographical Maps
- Meteorological Data

## CONSTRUCTION AND GRADING OPERATIONS CHECKLIST FOR PROJECTS GREATER THAN AN ACRE

**ELEMENTS THAT MUST BE INCLUDED:**

Each of the following sources of dust emissions **MUST** be addressed in the Asbestos Dust Mitigation Plan:

- Track-out onto the paved public road;
- Active storage piles;
- Inactive disturbed surface areas and storage piles;
- Traffic on unpaved on-site roads;
- Earthmoving activities;
- Off-site transport of materials; and
- Post-project stabilization of disturbed soil surfaces.

**ASBESTOS AIR MONITORING PLANS:**

If required by the District, complete an Asbestos Air Monitoring Plan for District approval.

An air monitoring plan **MAY BE** required if one or more of the following lies within a quarter mile (400 meters) of any boundary of an area to be disturbed:

- Residence;
- School / Daycare center;
- Industrial Facility
- Business;
- Park / Playground;
- Hospital / Nursing Home

**Development of an Asbestos Air Monitoring Plan does not constitute a requirement to implement air monitoring.**

However, if the District would like to determine the effectiveness of the application of the dust mitigation measures listed in your dust mitigation plan, the plan would be required to be implemented within one business day of notification from the District.

# ASBESTOS DUST MITIGATION PLAN APPLICATION

BAY AREA AIR QUALITY MANAGEMENT DISTRICT 939 Ellis Street, San Francisco, CA 93109

## 5. Track-out onto the paved public road

Please mark the box preceding each measure that will be implemented:

### THIS MEASURE MUST BE ADDRESSED:

- Any visible track-out on a paved public road at any location where vehicles exit the work site **MUST** be removed; Removal **MUST** be done using wet sweeping or a HEPA filter-equipped vacuum device at the end of the work day or at least one time per day.

### AND installation of one or more of the following track-out prevention measures:

- A gravel pad designed using good engineering practices to clean the tires of exiting vehicles
- A tire shaker
- A wheel wash system
- Pavement extending for not less than fifty (50) consecutive feet from the intersection with the paved public road
- Any other measure(s) as effective as the measures listed above: (Briefly describe below)

## 6. Active Storage Piles

### THIS MEASURE MUST BE ADDRESSED:

- Keep active storage piles adequately wet or covered with tarps.

## 7. Inactive Areas and Storage Piles

Please mark the box preceding each measure that will be implemented:

Control for disturbed surface areas and storage piles that will remain inactive for more than seven (7) days shall include one or more of the following:

- Keep the surface adequately wet;
- Establish and maintain of surface crusting sufficient to satisfy the test in subsection 93105(h)(6);
- Apply chemical dust suppressants or chemical stabilizers according to the manufacturer's recommendations;
- Cover with tarp(s) or vegetative cover;
- Install wind barriers of fifty percent (50%) porosity around three (3) sides of a storage pile;
- Install wind barriers across open areas;
- Any other measure(s) deemed as effective as the measures listed above. (Briefly describe below)

# ASBESTOS DUST MITIGATION PLAN APPLICATION

BAY AREA AIR QUALITY MANAGEMENT DISTRICT 939 Ellis Street, San Francisco, CA 93109

## 8. Traffic on On-Site Unpaved Roads, Parking Lots, and Staging Areas

Please mark the box preceding each measure that will be implemented:

### THIS MEASURE MUST BE ADDRESSED:

- A maximum vehicle speed limit of fifteen (15) miles per hour or less;

### AND one or more of the following:

- Water every two hours of active operations or sufficiently often to keep the area adequately wetted;
- Apply chemical dust suppressants consistent with manufacturer's directions;
- Install wind barriers of fifty (50) percent porosity around three (3) sides of a storage pile;
- Maintain a gravel cover with a silt content that is less than five (5) percent and asbestos content that is less than 0.25 percent, as determined using an approved asbestos bulk test method, to a depth of three (3) inches on the surface being used for travel; or
- Any other measure(s) deemed as effective as the measures listed above. (Briefly describe below)

## 9. Earth Moving Activities

Please mark the box preceding each measure that will be implemented:

### Control for earthmoving activities must include one or more of the following:

- Pre-wet the ground to the depth of anticipated cuts;
- Suspend grading operations when wind speeds are high enough to result in dust emissions crossing the property line, despite the application of dust mitigation measures;
- Apply water prior to any land clearing; or
- Any other measure(s) deemed as effective as the measures listed above. (Briefly describe below)

# ASBESTOS DUST MITIGATION PLAN APPLICATION

BAY AREA AIR QUALITY MANAGEMENT DISTRICT 939 Ellis Street, San Francisco, CA 93109

## 10. Off-Site Transport

Please mark the box preceding each measure that will be implemented:

### THIS MEASURE MUST BE ADDRESSED:

The owner or operator must ensure that no trucks are allowed to transport excavated material off-site unless:

- Maintain trucks such that no spillage can occur from holes or other openings in cargo compartments; **AND**
- Loads are adequately wet;

### AND Either of the following measures:

- Cover with tarps; or
- Load such that the material does not touch the front, back, or sides of the cargo compartment at any point less than six inches from the top and that no point of the load extends above the top of the cargo compartment.

## 11. Post Construction Stabilization of Disturbed Areas

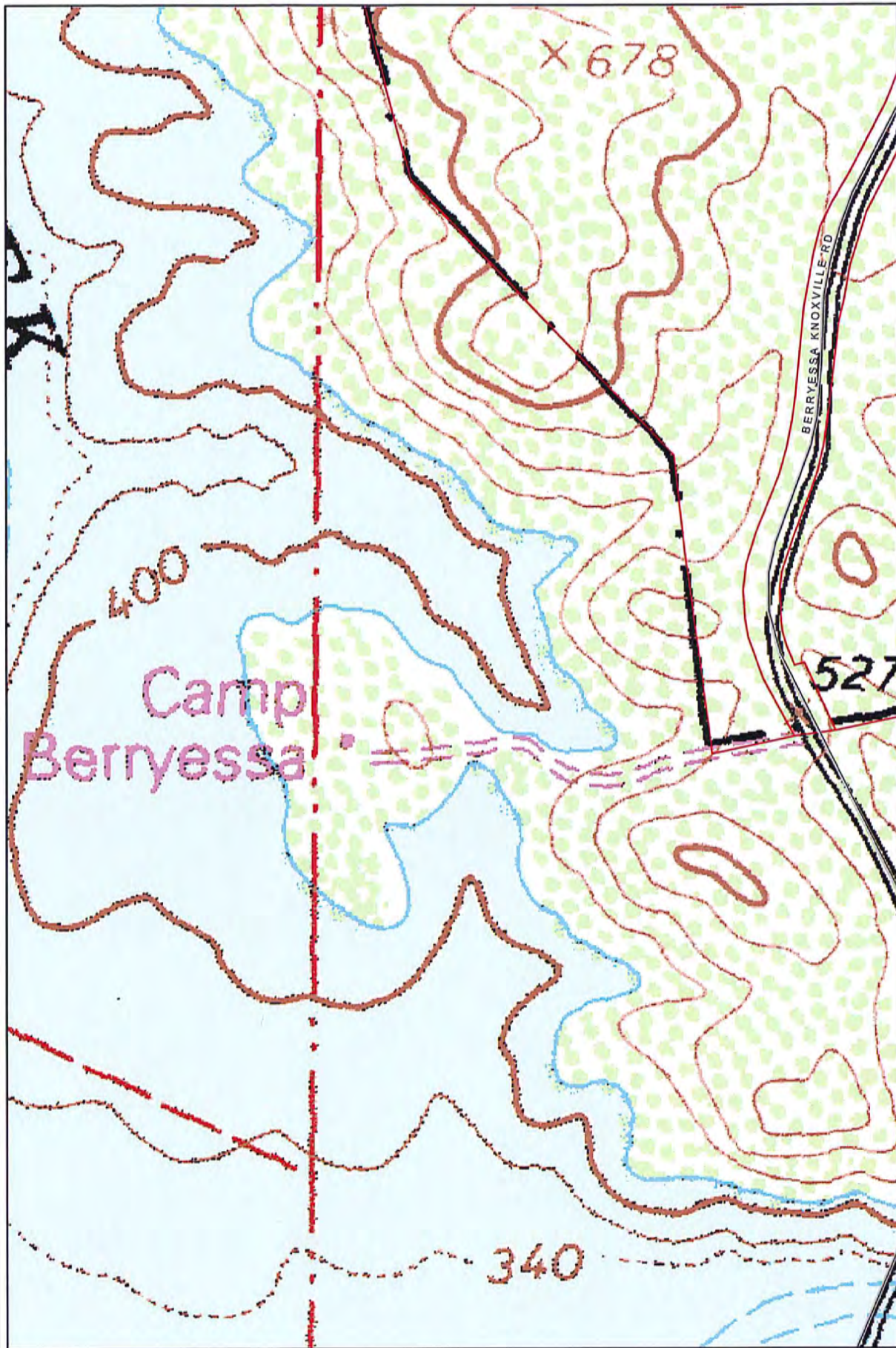
Please mark the box preceding each measure that will be implemented:

Upon completion of the project, disturbed surfaces shall be stabilized using one or more of the following:

- Establish a vegetative cover;
- Place at least three (3.0) inches of non-asbestos-containing material;
- Paving; or
- Any other measure deemed sufficient to prevent wind speeds of ten (10) miles per hour or greater from causing visible dust emissions. (Briefly describe below)



A Tradition of Stewardship  
A Commitment to Service




### Legend

-  Address Points
-  Major Roads
-  Parcels
-  American Canyon
-  Callistoga
-  County
-  Napa
-  St Helena
-  Yountville
-  County Boundary

Horizontal Datum: NAD 83,  
CA State Plane Coordinates,  
Zone II, feet  
Disclaimer: This map was prepared for  
informational purpose only. No liability  
is assumed for the accuracy of the  
data delineated hereon.



County of Napa 

Conservation, Development  
& Planning

Planning General

Revised Date: 8/25/2011





A Tradition of Stewardship  
A Commitment to Service



### Legend

- Address Points
- Major Roads
- Soil types
- Geology**
- GEO\_UNIT**
- Artificial fill (historic)
- Surficial deposits (Quar...)
- Clear Lake Volcanics (Pli...
- Other Pleistocene - Pli...
- Sonoma Volcanics (Pli...
- Late Tertiary Assembla...
- Early Tertiary Assembl...
- Great Valley Complex (...
- Franciscan Complex (C...
- Water
- Parcels
- American Canyon
- Calistoga
- County
- Napa
- St Helena
- Yountville
- County Boundary

### 2011 Air Photos

- RGB**
- Red: Band\_1
  - Green: Band\_2
  - Blue: Band\_3

Horizontal Datum: NAD 83,  
CA State Plane Coordinates,  
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County of Napa

Conservation, Development  
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Planning General

Revised Date: 6/25/2011



A Tradition of Stewardship  
A Commitment to Service



### Legend

- Address Points
- Major Roads
- Parcels
- American Canyon
- Calistoga
- County
- Napa
- St Helena
- Yountville
- County Boundary
- Non-Watershed - 10 ft
- Watershed - 5 ft.

### 2011 Air Photos

- RGB
- Red: Band\_1
  - Green: Band\_2
  - Blue: Band\_3

Horizontal Datum: NAD 83.  
CA State Plane Coordinates,  
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