

**CITY OF FOLSOM**  
**ENVIRONMENTAL & WATER RESOURCES DEPT.**  
50 NATOMA STREET  
FOLSOM, CALIFORNIA 95630

**PROJECT MANUAL  
FOR  
WATER TREATMENT PLANT BACKWASH  
AND RECYCLED WATER CAPACITY  
PROJECT**



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

**NON-MANDATORY PRE-BID CONFERENCE  
THURSDAY, FEBRUARY 24, 2022 AT 10:00 A.M.  
FOR PRE-BID INFORMATION CONTACT**

**NATHAN STITES  
NSTITES@FOLSOM.CA.US  
(916) 461-6167**

**BIDS TO BE RECEIVED BEFORE  
10:00 A.M., TUESDAY, MARCH 15, 2022  
OFFICE OF CITY CLERK  
50 NATOMA STREET, FOLSOM CA 95630**

# **WATER TREATMENT PLANT BACKWASH AND RECYCLED WATER CAPACITY PROJECT**

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# NOTICE TO CONTRACTORS

Sealed Proposals will be received by the Office of the City Clerk for the City of Folsom at 50 Natoma Street, Folsom, CA 95630 up to the hour of **10:00 A.M. on Tuesday, March 15, 2022**. Bid opening will take place at **10:05 A.M., Tuesday, March 15, 2022**, or as soon thereafter as business allows, at Folsom City Hall in the Council Chambers for construction of:

## **WATER TREATMENT PLANT BACKWASH AND RECYCLED WATER CAPACITY PROJECT**

In order to attend the bid opening process, members of the public entering any indoor City facility must wear a mask or face covering unless exempt from the statewide mask mandate due to COVID-19. In accordance with the Contract Documents issued by the City of Folsom, bids must be submitted on printed forms supplied by the Environmental & Water Resources Department, enclosed in an envelope marked:

### **SEALED PROPOSALS FOR: WATER TREATMENT PLANT BACKWASH AND RECYCLED WATER CAPACITY PROJECT**

Copies of the Sealed Proposal forms and accompanying documents (specifications and reduced size drawings) will be available starting **Monday, February 14, 2022 at 10:00 A.M.** at **www.CIPList.com**. Each Bidder must be added to the plan holder's list for the Project, receive addenda, and be eligible to bid the Project.

The project is generally described as demolition of three existing submersible decant pumps, installation of three new submersible decant pumps, replacement of piping, influent shear/slide gates, valves, and other appurtenances for the Decant Pump Station, installation of approximately 175 linear feet of 36" welded steel RBW pipe and valves, temporary bypass pumping substituting for the Decant Pump Station and temporary water barrier in the Reclamation Backwash Basin (RBB), miscellaneous civil sitework including AC pavement and concrete replacement associated with the Work, and associated electrical, instrumentation, and controls.

Contractor's License Requirement: Class A-General Engineering Contractor.

A **non-mandatory** Pre-Bid Meeting will be held in-person at the City of Folsom Water Treatment Plant on **Thursday, February 24, 2022 at 10:00 A.M.** The City of Folsom Water Treatment Plant is located at:

- 194 Randall Drive, Folsom, CA 95630

Requests for technical information, or clarification shall be directed to the City's representatives, Nathan Stites, City of Folsom, [nstites@folsom.ca.us](mailto:nstites@folsom.ca.us), on or before **Friday, March 4, 2022 at 2:00 P.M.**

City affirmatively identifies this project as a “public work” as that term is defined by Labor Code Section 1720, and the project is, therefore, subject to prevailing wages under Labor Code Section 1771.

Contractor and its subcontractors shall fully comply with all the provisions of the California Labor Code governing the performance of public works contracts including, but not limited to, payment of prevailing wages, limitations on time worked, compliance with apprentice requirements, maintenance of payroll records, posting of wages at the job site and prohibitions against discrimination. The prevailing rates so determined are on file with the City Clerk and they are available for public inspection. They may also be obtained on the internet at <http://www.dir.ca.gov/OPRL/dprevwagedetermination.htm>. Those prevailing wage rates hereby are incorporated in this Contract and made a part hereof. (See General Provisions, Article 6, Section 6.01)

Pursuant to California Public Contracts Code, any contract awarded pursuant to this invitation for bid shall obtain a provision permitting the substitution of securities for any moneys withheld to ensure performance under the contract. The terms of such provisions shall be according to the requirements of the Public Contracts Code Section 22300.

Each bid must be accompanied by security consisting only of cash, California Bank Cashier’s Check, Certified Check, California Bank Money Order, or bid bond made payable to the “City of Folsom” in the sum of ten percent (10%) of the sum of the proposal.

The City is not responsible for misdelivered Proposals, and the Proposer is strictly liable for ensuring the proposals’ delivery and receipt by the City. Any Proposal which does not actually arrive in the City Clerk’s Office by the due date and time will be rejected as non-responsive.

The Contract will be awarded to the lowest responsive responsible bidder. This process is conducted by City in a “blind selection” format, i.e., without knowledge of the identity of any of the bidders before ranking of all bidders from lowest to highest has been determined. All awards will be made in City's best interest.

The right to reject any and all bids, or waive any informality in any bid received is reserved by the City Council.

Engineer’s Estimated Construction Cost - \$1,400,000

Marcus Yasutake  
Environmental & Water Resources Dept. Director

**CITY OF FOLSOM**  
**SEALED PROPOSAL**

(MUST BE SIGNED BY BIDDER)

Sealed Proposals will be received not later than **10:00 A.M. on Tuesday, March 15, 2022** at the Office of City Clerk, 50 Natoma Street, Folsom, California and opened at **10:05 A.M.**, or as soon thereafter as business allows at Folsom City Hall in the Council Chambers, 50 Natoma Street, Folsom, California.

TO THE HONORABLE CITY COUNCIL: \_\_\_\_\_

The undersigned hereby proposes and agrees to furnish any and all required labor, material, transportation, and services for

**WATER TREATMENT PLANT BACKWASH AND RECYCLED WATER CAPACITY  
PROJECT**

in the City of Folsom, County of Sacramento, California.

The work is to be done in strict conformity with the Contract Documents, at the following prices:

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL
1	Mobilization & Demobilization	1	LS		
2	Shoring	1	LS		
3	36-inch RBW piping	1	LS		
4	Decant pump station upgrades	1	LS		
5	Temporary bypass pumping	1	LS		
6	Site Work	1	LS		
7	Electrical and Controls	1	LS		

Total Project Bid, Item Nos. 1 through 7, shall be (spell out):

\_\_\_\_\_ Dollars.

If awarded the contract, the undersigned shall execute said Contract and furnish the necessary bonds within **ten (10) calendar days** after the Notice of Award of said Contract and begin work within **ten (10) calendar days** from and after receipt of written Notice to Proceed from City to Contractor.

In determining the amount bid by each bidder, the City of Folsom (City) shall disregard mathematical errors in addition, subtraction, multiplication, and division that appear obvious on the face of the Proposal. When such a mathematical error appears on the Proposal, the City shall have the right to correct such error and to compute the total amount bid by said bidder on the basis of the corrected figure or figures.

When an item price is required to be set forth in the Proposal, and the total for the item set forth separately does not agree with a figure which is derived by multiplying the item price times the Engineer's estimate of the quantity of work to be performed for said item, the item price shall prevail over the sum set forth as the total for the item unless, in the sole discretion of the City, such a procedure would be inconsistent with the policy of the bidding procedure. The total paid for each such item of work shall be based upon the item price and not the total price. Should the Proposal contain only a total price for the item and the item price is omitted, the City shall determine the item price by dividing the total price for the item by Engineer's estimate of the estimated quantities of work to be performed as items of work.

If the Proposal contains neither the item price nor the total price for the item, then it shall be deemed incomplete and the Proposal shall be disregarded.

It is understood that this bid is based upon completion of the work within a period of **365 calendar days** commencing on the day the Notice to Proceed is issued. Contractor must honor bid price regardless of when the NTP is issued.

The amount of the liquidated damages to be paid by the Contractor for failure to complete the entire work by the Completion Date (as extended, if applicable) will be **\$1,500 for each calendar day**, continuing to the time at which the work is completed. Such amount is the actual cash value agreed upon as the loss to the City resulting from Contractor's default.

The undersigned represents and warrants that the undersigned has examined the location of the proposed work and is familiar with the local conditions at the place where the work is to be done, and the undersigned has reviewed and understands the plans, specifications and other contract documents, and the undersigned is satisfied with all conditions for the performance of the work.

The undersigned has checked carefully all of the above figures and understands that the City of Folsom will not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

The contractor shall initial below that he has received the appropriate addenda and has incorporated the addenda into his bid.

<u>Addenda</u>	<u>Received and Acknowledged</u>
No. 1	_____
No. 2	_____
No. 3	_____

BID DEPOSIT ENCLOSED IN THE FOLLOWING FORM:

\$ \_\_\_\_\_ not less than ten percent (10%) of amount bid.

- ☐ CERTIFIED CHECK
- ☐ MONEY ORDER
- ☐ CASHIER'S CHECK
- ☐ BID BOND

**BIDDER'S CHECKLIST**

(ENSURE ALL OF THE FOLLOWING ARE INCLUDED WITH THIS SEALED PROPOSAL):

- ☐ **CHECK HERE TO ACKNOWLEDGE CHANGES TO GENERAL PROVISIONS (SEE SPECIAL PROVISIONS SP-38)** I hereby acknowledge receipt of the changes to the standard specifications of the City of Folsom. I further acknowledge that these changes replace and supersede any and all affected sections and conflicting language within the revision of the standard specifications that is current as of the date of this request for proposal.
- ☐ CERTIFICATE OF AUTHORIZATION
- ☐ SUB-BIDDER FORM
- ☐ NONCOLLUSION AFADAVIT
- ☐ WORKER'S COMPENSATION INSURANCE CERTIFICATION
- ☐ RESOLUTION OF DISPUTES REGARDING THE BIDDING PROCESS
- ☐ BIDDER'S BOND

**CONTRACTOR**

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

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

Telephone No.: \_\_\_\_\_

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

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

Dept. of Ind. Relations Reg. No.: \_\_\_\_\_

License Required: **Class A Contractor**

Valid Contractor's License No. \_\_\_\_\_ is held by the bidder.

The Expiration date is \_\_\_\_\_.

Anticipated set date of Notice to Proceed \_\_\_\_\_

Representations contained within this bid are made under penalty of perjury.

# CERTIFICATE OF AUTHORIZATION

(If Bidder is a Corporation or a Limited Liability Corporation)

STATE OF CALIFORNIA

COUNTY OF \_\_\_\_\_

I HEREBY CERTIFY that at a meeting of the Board of Directors of the \_\_\_\_\_, a corporation existing under the laws of the State of California, held on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_,  
as \_\_\_\_\_ President of the Corporation, be and is hereby  
authorized to execute the Bid dated \_\_\_\_\_, 20\_\_\_\_, to the City of  
Folsom and this Corporation and that his/her execution thereof, attested by the  
Secretary of the Corporation, and with the Corporate seal fixed, shall be the  
official act and deed of this Corporation.”

I further Certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the Corporation this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
Corporate Officer

(seal)

\_\_\_\_\_  
Corporate Address

# CERTIFICATE OF AUTHORIZATION

(If Bidder is a Partnership)

STATE OF CALIFORNIA

COUNTY OF \_\_\_\_\_

I HEREBY CERTIFY that at a meeting of the Partners of the \_\_\_\_\_, a partnership existing under the laws of the State of California, held on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as \_\_\_\_\_ of the Partnership, be and is hereby authorized to execute the Bid dated \_\_\_\_\_, 20\_\_\_\_, to the City of Folsom and this Partnership and that his/her execution thereof, attested by the \_\_\_\_\_ shall be the official act and deed of this Partnership.”

I further Certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Managing Partner

\_\_\_\_\_  
Partnership Address



# CERTIFICATE OF AUTHORIZATION

(If Bidder is a Joint Venture)

STATE OF CALIFORNIA

COUNTY OF \_\_\_\_\_

I HEREBY CERTIFY that at a meeting of the Principals of the \_\_\_\_\_, a joint venture existing under the laws of the State of California, held on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_,  
as \_\_\_\_\_ of the Joint Venture, be and is hereby  
authorized to execute the Bid dated \_\_\_\_\_, 20\_\_\_\_, to the City of  
Folsom and this Joint Venture and that his/her execution thereof, attested by the  
\_\_\_\_\_ shall be the official act and deed of this Joint  
Venture.”

I further Certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the Joint Venture this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Managing Principal

(seal)

\_\_\_\_\_  
Joint Venture Address

# SUB-BIDDER FORM

As of March 1, 2015 Contractors (and sub-contractors) wishing to bid on public works contracts shall be registered with the State Division of Industrial Relations and certified to bid on Public Works contracts.

Please register at:

<https://www.dir.ca.gov/public-works/contractor-registration.html>

In accordance with Section 4104 of the Public Contract Code of the State of California, as amended, the following information is required for each subcontractor who will perform work amounting to more than one half of one percent (0.05%) of the Total Cost Base Bid. In addition, this form will be used to determine if the bidder is responsive to Section 2.08 of the General Provisions.

Name of Sub-Bidder	Street Address of Shop, Mill, or Office (Shall be completed within 2 working days of bid opening by apparent low bidder)	License Type and Number	Dept. of Ind. Relations Reg. No.	Portion of Work to be Done by Specification Section	Percentage of Total Work

# NONCOLLUSION AFFIDAVIT

To be Executed by Bidder and Submitted with Bid

STATE OF CALIFORNIA

COUNTY OF \_\_\_\_\_

\_\_\_\_\_, being first duly shown, deposes and says that he or she is \_\_\_\_\_ of \_\_\_\_\_, the party making the forgoing 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 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 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.

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

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

Subscribed and sworn to before me this

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

(seal)

\_\_\_\_\_  
*Notary Public*

# CALIFORNIA CODE SECTIONS

## **Public Contracts Code §7103.5. Unfair business practices claim; assignment by contractor to awarding body**

(a) As used in this section:

(1) “Public works contract” means a contract awarded through competitive bids by the state or any of its political subdivisions or public agencies, on whose behalf the Attorney General may bring an action pursuant to subdivision (c) of Section 16750 of the Business and Professions Code, for the erection, construction, alteration, repair, or improvement of any structure, building, road, or other improvement of any kind.

(2) “Awarding body” means the state or the subdivision or agency awarding a public works contract.

(b) In entering into a public works contract or 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. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties.

(c) Subdivision (b) shall be included in full in the specifications for the public works contract or in the general provisions incorporated therein and shall be included in full in the public works contract or in the general provisions incorporated therein.

Added Stats 1978 Ch 414 § 1.

## **Government Code §4552. Assignment by bidder to purchasing body of rights under federal law arising from purchases pursuant to bid**

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid, Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

The preceding provisions of this section shall be included in full in any specifications for the public purchase and shall be included in full in the bid agreement or general provisions incorporated into the bid agreement.

Added Stats 1978 Ch 414 § 1.

**BIDDER'S BOND**

**City of Folsom  
Environmental & Water Resources Department**

We, \_\_\_\_\_, as principal, and \_\_\_\_\_, as Surety are bound unto the City of Folsom, Environmental and Water Resources Department, hereafter referred to as "Obligee", in the penal sum of ten percent (10%) of the total amount of the bid including additive alternates, if any, of the Principal submitted to the Obligee for the work described below, for the payment of which sum we bind ourselves jointly and severally,

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

WHEREAS, the Principal is submitting a bid to the obligee, for \_\_\_\_\_

\_\_\_\_\_  
*(Copy here the exact description of work, including location, as it appears on the proposal)*

\_\_\_\_\_  
for which; bids are to be opened at Folsom, CA on \_\_\_\_\_  
*(Insert date of bid opening)*

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

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

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

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

Principal: \_\_\_\_\_

APPROVED AS TO FORM:

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

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

Telephone: \_\_\_\_\_

\_\_\_\_\_  
*City Attorney*

Attorney in Fact: \_\_\_\_\_

**NOTICE:**

**A CERTIFICATE OF ACKNOWLEDGMENT IN ACCORDANCE WITH THE PROVISIONS OF CIVIL CODE SECTION 1189 MUST BE ATTACHED FOR EACH PERSON EXECUTING THIS AGREEMENT ON BEHALF OF CONTRACTOR AND SURETY.**

# WORKERS' COMPENSATION INSURANCE CERTIFICATION

TO THE CITY OF FOLSOM:

The undersigned does hereby certify that Bidder is aware of the provisions of Section 3700 et seq. of the Labor Code which require every employer to be insured against liability for workmen's compensation claims or to undertake self-insurance in accordance with the provisions of said Code, and that Bidder will comply with such provisions before commencing the performance of work on this contract.

Bidder: \_\_\_\_\_

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

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

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

\_\_\_\_\_

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

---

## PLEASE READ CAREFULLY BEFORE SIGNING

---

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: *(example)*

1. An individual using a firm name, sign: "John Doe, an individual doing business as Blank Company."
2. An individual doing business under his/her own name, sign your name only.
3. A co-partnership, sign: "John Doe, and Richard Doe, co-partners doing business as Blank Company, by, John Doe, Co-Partner."
4. A corporation, sign: "Blank Company, by John Doe, Secretary." (or other title).

# **RESOLUTION OF DISPUTES REGARDING THE BIDDING PROCESS**

The lack of a prompt procedure to resolve disputes regarding the bidding process would impair the City's ability to carry out its purpose of constructing this project in a timely manner. Therefore, to the maximum extent authorized by law and notwithstanding any other procedures specified in documents referenced herein, all disputes and/or protests regarding the bidding process shall be subject to the following procedure. In submitting a bid to the City for this project, the bidder agrees to comply with and to be bound by this procedure.

1. Within five days after the opening of bids, bidder shall provide a written notice to the City of any and all mistakes regarding the bid for which a bidder requests relief. The City shall not consider any requests for relief due to mistake if notice is not received within the specified time period.
2. All bidders shall be provided with notice of the date and time of the City Council meeting at which the award of the contract for this project shall be considered. All bidders will be provided with an opportunity to bring to the City Council's attention disputes and/or protests regarding the bidding process. No bidder may bring any action or proceeding challenging the bidding process unless the alleged grounds for the dispute and/or protest are presented to the City Council before or during the meeting referenced above, and before action by the City Council on award of the contract.
3. Any bidder complying with the above procedure may bring an action within sixty (60) days from the action of the City Council, in accordance with Section 860 of the California Code of Civil Procedure, to determine the validity of the City Council's action on the award of the contract. The City shall be a defendant and shall be served with the summons and complaint in the action in the manner provided by law for the service of a summons in a civil action. In any such action the summons shall be in the form prescribed in Section 861.1 of the California Code of Civil Procedure except that in addition to being directed to "all persons interested in the matter of [specifying the matter]," it shall also be directed to the City. If the bidder bringing such action fails to complete the publication and such other notice as may be prescribed by the court in accordance with Section 861 of the California Code of Civil Procedure and to file proof thereof in the action within 60 days from the filing of his complaint, the action shall be dismissed on the motion of the City unless good cause for such failure is shown by the bidder.

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Contractor

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Date

---

Signature

**THE FOLLOWING FORMS TO BE FILLED OUT AND SIGNED**

**ONLY**

**IF AWARDED CONTRACT**





## CONSTRUCTION AGREEMENT

**THIS AGREEMENT**, dated for identification as of \_\_\_\_\_, 20\_\_\_\_, is between the **CITY OF FOLSOM**, a municipal corporation, (hereinafter called "City"), and \_\_\_\_\_, (hereinafter called "Contractor").

The parties hereto mutually agree to the terms and condition set forth herein.

### 1. CONTRACT DOCUMENTS

- A. The Contract Documents referred to herein are incorporated herein by reference as if set forth in full in this Agreement. Work called for in any one Contract Document and not mentioned in another is to be performed and executed as if mentioned in all Contract Documents.
- B. The Contract Documents shall include the Notice to Contractors, the completed Proposal Form submitted by Contractor, this Agreement, the Bid Bond, the Performance Bond, the Payment Bond, the Standard Construction Specifications, the General Provisions, the Special Provisions, Exhibits, the Contract Drawings and Plans, the Technical Specifications, any project-specific specifications or documents, all duly issued Addenda, Interpretations, Field Instructions, Written Directives, Supplemental Drawings, the Contractor's Guarantee and Bond, the Contract Schedule, Storm Water Pollution Prevention Plan (whether prepared by the City or the Contractor) and any and all supplemental agreements amending or extending the Work contemplated and which may be required to complete the Work in an acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the Contract Documents and include Change Orders.
- C. The Standard Specifications shall mean and refer to the current Standard Construction Specifications of the City of Folsom, which are incorporated herein by this reference as if set forth herein.

### 2. AGREEMENT CONTROLS

In the event of a conflict between the terms and conditions as set forth in this Agreement and the terms and conditions set forth in other Contract Documents, the terms and conditions set forth in this Agreement shall prevail. Unless otherwise specifically provided herein, all works and phrases defined in the Standard Specifications shall have the same meaning and intent in this Agreement.

### 3. SCOPE OF CONTRACT

Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor and material and transportation necessary to perform and complete in a good and workman like manner to the satisfaction of City, all the work called for, and in the manner designated in, and in strict conformity with the Project entitled:

#### **4. CONTRACT AMOUNT AND PAYMENTS**

City agrees to pay and Contractor agrees to accept, in full payment for the above work, **DOLLARS (\$        )** as the stipulated sum price which Contractor bid in his Proposal Form.

#### **5. PROGRESS AND FINAL PAYMENTS**

Progress and final payments shall be in accordance with the Standard Specifications.

#### **6. RETENTION OF SUMS CHARGED AGAINST CONTRACTOR**

When, under the provisions of this Contract, City is authorized to charge any sum of money against Contractor, City may deduct and retain the amount of such charge from the amount of the next succeeding progress estimate, or from any other moneys due or that may become due to the Contractor from City. If, on completion or termination of the Contract, sums due contractor are insufficient to pay City's charges against him, City shall have the right to recover the balance from Contractor or his sureties.

#### **7. TIME OF COMPLETION**

- A. The entire work shall be brought to completion in the manner and within the time period provided for in the Contract Documents, commencing on the date of issuance of the Notice to Proceed.
- B. Failure to complete the entire work by the completion date and in the manner provided for by the Contract Documents shall subject Contractor to liquidated damages as hereinafter provided in this Agreement. Time is of the essence in these Contract Documents.

#### **8. INSURANCE**

Contractor shall maintain in full force and effect at all times during the term of the Agreement, at its sole expense, policies of insurance in accordance with the Contract Documents, including, but not limited to, Exhibit A, attached hereto and incorporated herein by reference.

#### **9. NO WAIVER OF REMEDIES**

- A. Neither the inspection by City or its agents, nor any order or certificate for the payment of money, nor any payment for, nor acceptance of the whole or any part of the work by City, nor any extensions of time, nor any position taken by City or its agents shall operate as a waiver of any provision of this Agreement or of any power herein reserved to City or any right to damages herein provided, nor shall any waiver of any breach of the Agreement be held to be a waiver of any other or subsequent breach.
- B. All remedies provided in this Agreement shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided, and City shall have any and all equitable and legal remedies which it would in any case have.

#### **10. DETERMINATION OF DAMAGES**

- A. The actual fact of the occurrences of damages and the actual amount of the damages which City would suffer if the work were not completed within the specified times set forth are dependent upon many circumstances and conditions and, it is impracticable and extremely difficult to fix the actual damages. Damages which City would suffer in the event of delay include loss of the use of the project, and, in addition, expenses of prolonged employment of an architectural and engineering staff; costs of administration, inspection, and supervision; and the loss suffered by the public within the City of Folsom by reasons of the delay in the completion of

the project to serve the public at the earliest possible time.

- B. Accordingly, the parties hereto agree, and by execution of this Agreement, Contractor acknowledges that he understands, has ascertained and agrees, that the amounts set forth herein as liquidated damages shall be presumed to be that amount of damages sustained by the failure of Contractor to complete the entire work within the times specified.

#### 11. LIQUIDATED DAMAGES

- A. The amount of the liquidated damages to be paid by Contractor to City for failure to complete the entire work in the specified number of Working or Calendar Days (as extended, if applicable) will be (\$ ) for each **Calendar Day**, continuing to the time at which the work is completed.
- B. Such amount is the actual cash value agreed upon as the loss to City resulting from Contractor's delay.

#### 12. TERMINATION AFTER ALLOTTED WORKING OR CALENDAR DAYS

- A. In addition to any rights it may have, City may terminate this Contract at any time after the allotted number of Working or Calendar Days as adjusted by any extensions of time for excusable delays that may have been granted.
- B. Upon such termination, Contractor shall not be entitled to receive any compensation for services rendered by him before or after such termination, and he shall be liable to City for liquidated damages for all periods of time beyond such termination date until the work is completed.

#### 13. CONTRACTOR BANKRUPT

- A. If Contractor should commence any proceeding under the Bankruptcy Act, or if contractor be adjudged a bankrupt, or if Contractor should make any assignment for the benefit of creditors, or if a receiver should be appointed on account of Contractor's insolvency, then the City Council may, without prejudice to any other right or remedy, terminate the Contract and complete the work by giving notice to Contractor and his surety according to the provisions of Article 5 of the General Provisions.
- B. City shall have the right to complete, or cause completion of the work, all as specified in the General Provisions of the Standard Specifications.

#### 14. PERFORMANCE AND PAYMENT BONDS

- A. The Contractor shall, before beginning said work, file two bonds with the City, each made payable to the City. These bonds shall be issued by a Surety Company authorized to do business in the State of California, and shall be maintained during the entire life of the Contract at the expense of the Contractor.
  - 1. One bond shall be in the amount of one hundred percent (100%) of the Contract and shall guarantee the Faithful Performance of the Contract.
  - 2. The second bond shall be the Payment Bond required by Part 4, Title 15, Chapter 7, Division Three of the Civil Code of the State of California and shall be in the amount of one hundred percent (100%) of the Contract.
- B. Any alteration or alterations made in any provision of this Contract shall not operate to release any surety from liability on any bond required hereunder and the consent to make such alterations is hereby given, and any surety on said bonds hereby waives the provisions of Section 2819 of the Civil Code.
- C. Bonds shall only be accepted from an "*Admitted surety insurer*," which means an insurer to

which the Insurance Commissioner has issued a certificate of authority to transact surety insurance in this state. **Contractor must submit** the original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws or other instrument entitling or authorizing the person who executed the bond to do so.

D. All bonds submitted shall include the following:

1. Full name and address of the Contractor Surety, and the City;
2. Contract Date;
3. Exact Contract Sum;
4. Project Name and Address;
5. Signature of the Contractor
6. Corporate Seal, if applicable;
7. Signature of Authorized Surety Representative;
8. Notarization of the Contractor and Surety;
9. Power of Attorney; and
10. Local contact for surety, with name, phone number, and address to which legal notices may be sent

#### 15. SUBSTITUTION OF SECURITIES OF MONEY WITHHELD

- A. At any time prior to final payment, Contractor may request substitution of securities for any money withheld by the City to ensure performance of the Contract.
- B. At the expense of the Contractor, securities equivalent to the money withheld may be deposited with the City or with an approved financial institution as escrow agent according to a separate Security Agreement.
- C. Securities eligible for substitution shall include those listed in Section 16430 of the Government Code or bank or savings and loan certificates of deposit. A fee set by the City Council shall be charged for such substitution.

#### 16. LABOR CODE AND PUBLIC CONTRACT CODE COMPLIANCE

- A. City affirmatively identifies this project as a “public work” as that term is defined by Labor Code section 1720, and the project is, therefore, subject to prevailing wages under Labor Code section 1771.
- B. Contractor and its subcontractors shall fully comply with all the provision of the California Labor Code governing the performance of public works contracts including, but not limited to, payment of prevailing wages, limitations on time worked, compliance with apprentice requirements, maintenance of payroll records, posting of wages at job site and prohibitions against discrimination.
- C. Notice: This project may be subject to the skilled and trained workforce requirement under Public Contract Code section 2600. A “skilled and trained workforce” is defined by Public Contract Code section 2601(d).

#### 17. UNFAIR COMPETITION

The following provision is included in this agreement pursuant to California Public Contract Code §7103.5.

"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 assigning to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C.

Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties."

## **18. GENERAL LIABILITY OF CONTRACTOR**

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, light, heat, utilities, transportation and other facilities and services necessary for the execution and completion of the Work in accordance with the Contract Documents and any applicable code or statute, whether or not specifically described herein, as long as same is reasonably inferable therefrom as being necessary to produce the intended results, whether temporary or permanent, and whether or not incorporated or to be incorporated in the Work. The mention of any specific duty or liability of Contractor and, any reference to any specific duty or liability shall be construed to be for the purpose of explanation.

## **19. AUTHORITY OF THE CITY**

- A. The City will decide all questions regarding the quality and acceptability of materials furnished, work performed, and rate of progress of the Work. The City will decide all questions regarding the interpretation and fulfillment of the Contract on the part of the Contractor, and all questions as to the rights of different prime contractors involved with the Work. The City will determine the amount and quality of the Work performed and materials furnished for which payment is to be made under the Contract.
- B. The City will administer its authority through a duly designated representative identified at the pre-construction conference. The Contractor and the City's designated representative (the Owner's Representative) shall make good faith attempts to resolve disputes that arise during the performance of the Work.
- C. Any order given by the City not otherwise required by the Contract to be in writing shall be given or confirmed by the City in writing at the Contractor's request. Such request shall state the specific subject of the decision, order, instruction, or notice and, if it has been given orally, its date, time, place, author and recipient.
- D. Any plan or method suggested to the Contractor by the City, the Architect or Consulting Engineer, or the Owner's Representative, but not specified or required in writing, if adopted or followed in whole or in part by the Contractor, shall be used at the risk and responsibility of the Contractor. The City assumes no responsibility.

## **20. RESPONSIBILITY OF THE CONTRACTOR**

- A. The Work shall be under the Contractor's responsible care and charge until completion and final acceptance, and the Contractor shall bear the entire risk of injury, loss, or damage to any part by any cause. The Contractor shall rebuild, repair, restore, and make good all injuries, losses or damage to any portion of the Work or the materials occasioned by any cause, and shall bear the entire expense.
- B. The mention herein of any specific duty or responsibility imposed upon the Contractor shall not be construed as a limitation or restriction of any other responsibility or duty imposed upon the Contractor by the Contract, said reference being made herein merely for the purpose of

explaining the specific duty or responsibility.

- C. The Contractor shall do all of the work and furnish all labor, materials, tools, equipment, and appliances, except as otherwise herein expressly stipulated, necessary or proper for performing and completing the Work herein required, including any change order work or disputed work directed by the City in conformity with the true meaning and intent of the Contract Documents, within the time specified.

## 21. CORRECTION OF WORK

- A. The Contractor shall promptly correct all work rejected by the Owner's Representative, Project Inspector or the Architect or Consulting Engineer as defective or as failing to conform to the Contract Documents, whether observed before or after final completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected work including compensation for the Architect's, Consulting Engineer's Project Inspector's and the Owner's Representative's additional services.
- B. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within three (3) days after receipt of written notice from the City to commence and continue correction of the default or neglect with diligence and promptness, the City may, without prejudice to any other remedy it may have, correct the deficiencies and may further elect to complete that portion of the Work through such means as the City may select, including the use of a new contractor. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting the deficiencies, and any other appropriate costs, including compensation for the Architect's or Consulting Engineer's, the Project Inspector's and the Owner's Representative's additional services made necessary by the default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover that amount, the Contractor shall pay the difference to the City.
- C. If within two (2) years after the Date of Completion and acceptance of the Work or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct any or all such work, together with any other work which may be displaced in so doing, without expense to the City, promptly after receipt of a written notice from the City unless the City has previously given the Contractor a written acceptance of such condition. The City shall issue a correction notice promptly after discovering the condition. The Contractor shall notify the City upon completion of repairs. This obligation shall survive termination of the Contract with respect to work in place prior to termination.
- D. The Contractor shall bear the cost of making good work destroyed or damaged by such correction or removal.
- E. Nothing contained in this Section shall be construed to establish a period of limitation with respect to any other obligations which the Contractor might have under the Contract Documents or by operation of law. The establishment of the time period of two (2) years after the Date of Completion, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the Work and has no relationship to the time within which an action may be commenced to establish the Contractor's liability with respect to its obligations other than specifically to correct the work

## **22. GUARANTEE REQUIRED**

- A. In addition to any guarantees required elsewhere by the Contract Documents, the Contractor shall guarantee the Work for a minimum of two (2) years from and after the recordation of the Notice of Completion and completion of all contract obligations by the Contractor, including formal acceptance of the entire Project by the City. The Contractor specifically waives any right to claim or rely on the statutory definition of completion set forth in Civil Code section 3086. The Contractor specifically acknowledges and agrees that completion shall mean the Contractor's complete performance of all Work required by the Contract Documents, amendments, change orders, construction change directives and punch lists, and the City's formal acceptance of the entire Project, without regard to prior occupancy, substantial completion doctrine, beneficial occupancy, or otherwise. Such guarantee shall be made on the form provided by the City.
- B. The guarantee period for corrected defective work shall continue for a duration equivalent to the original guarantee period.
- C. Such guarantee is in addition to, and not in lieu of, the City's rights to enforce this Contract in all respects.

## **23. NO CHANGES WITHOUT CONSENT**

- A. No extra work shall be performed, and no change shall be made, except pursuant to a written Change Order or Proposed Change Order signed by the City, or by CCD signed by either the City or the Owner's Representative, stating that the extra work or change is authorized, and no claim for any addition to the Contract Sum or Contract Time shall be valid unless so authorized; provided, however, that nothing in this Article shall excuse the Contractor from proceeding with the prosecution of the work so changed. The Contractor shall, when required by the Owner's Representative, furnish an itemized breakdown of the quantities and prices used in computing the value of any change requested by the Contractor, or that may have been ordered by the City.
- B. Change Orders shall specify the cost adjustments associated therewith, and in no case shall the City pay or become liable to pay any sums different than those specified or those established under Sections 9.04 and 9.05.
- C. Substitutions are considered change orders.

## **24. CHANGE ORDERS**

- A. Subject to legal requirements relating to competitive bidding, the City may require changes in, additions to, or deductions from the work to be performed or the materials to be furnished pursuant to the Contract Documents. Changes may be made pursuant to a written Change Order signed by the City, which shall state the agreement of the City, the Contractor, and the Architect or Consulting Engineer upon all of the following:
  - 1. The scope of the change in the Work
  - 2. The amount of the adjustment in the Contract Sum, if any; and
  - 3. The extent of the adjustment in the Contract Time, if any.
- B. All adjustments to the Contract Sum or the Contract Time must be approved by the City.
- C. Signature by the Contractor on the Change Order constitutes its agreement with and acceptance of the adjustments in the Contract Sum and Contract Time, if any, set forth in the Change Order as full and complete satisfaction of any direct or indirect additional cost and/or time incurred by the Contractor in connection with performance of the change work.

## **25. CONSTRUCTION CHANGE DIRECTIVE/CCD**

Changes also may be made pursuant to a CCD, which shall direct a change in the Work and state a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. A CCD shall be used in the absence of total agreement on the terms of a Change Order, or when time does not permit processing of a Change Order prior to implementation of the change. CCD's shall be approved by the City and the Architect or Consulting Engineer, but need not be signed by the Contractor. Upon receipt of a CCD, the Contractor shall promptly proceed with the change in the work involved. It is the intent of the City that all CCD's will be converted into a Change Order. When a CCD is used because time does not permit processing of a Change Order prior to implementation of the change, signature by the Contractor on the CCD constitutes its agreement with and acceptance of the adjustments in the Contract Sum and Contract Time, if any, set forth in the CCD as full and complete satisfaction of any direct or indirect additional cost and/or time incurred by the Contractor in connection with performance of the change work.

## **26. EXTENSIONS OF TIME; UNAVOIDABLE DELAYS**

- A. The Contractor shall not be granted an extension of time except on the issuance of a Change Order by the City, upon a finding of good cause for such extension.
- B. As used herein, the following terms shall have the following meanings:
  - 1. "Excusable Delay" means any delay in completion of the Work beyond the expiration of the Contract Time caused by conditions beyond the control and without the fault or negligence of the Contractor. These events may include strikes, embargoes, fire, unavoidable casualties, national emergency, and stormy and inclement weather conditions in which the Owner's Representative and Project Inspector agree that work on the critical path cannot continue. The financial inability of the Contractor or any Subcontractor or supplier and any default of any Subcontractor, without limitation, shall not be deemed conditions beyond the Contractor's control. An Excusable Delay may entitle the Contractor to an extension of the Contract Time, in accordance with this Section, but shall not entitle the Contractor to any adjustment of the Contract Sum.
  - 2. "Compensable Delay" means any delay in the completion of the Work beyond the expiration date of the Contract Time caused solely by the wrongful acts of the City and which delay is unreasonable under the circumstances and not within the contemplation of the parties. A Compensable Delay may entitle the Contractor to an extension of the Contract Time, in accordance with this Section and/or an adjustment of the Contract Sum. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay, interruption, hindrance, or disruption.
  - 3. "Inexcusable Delay" means any delay in completion of the Work beyond the expiration of the Contract Time resulting from causes other than those listed in Subparagraphs A1 and A2, above. An Inexcusable Delay will not entitle the Contractor to an extension of the Contract Time or an adjustment of the Contract Sum.
- C. The Contractor may make a claim for an extension of the Contract Time, for an Excusable Delay or a Compensable Delay, subject to the following:
  - 1. If an Excusable Delay and a Compensable Delay occur concurrently, the maximum extension of the Contract Time shall be the number of days from the commencement of the first delay to the cessation of the delay which ends last.



Any adjustment of the Contract Sum shall be in accordance with Article 9 and shall be based only on the non-concurrent portion of any Compensable Delay.

2. If an Inexcusable Delay occurs concurrently with either an Excusable Delay and/or a Compensable Delay, the maximum extension of the Contract Time shall be the number of days, if any, by which the duration of the Excusable Delay and/or the Compensable Delay calculated in accordance with subparagraph B1, if applicable, exceeds the Inexcusable Delay. The duration of the concurrence is non-compensable.

- D. Delays in the prosecution of parts or classes of the Work which do not prevent or delay the completion of the whole Work within the Contract Time are not to be considered Excusable or Compensable.
- E. Float or slack time is the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of activities on the Contract Schedule. No time extensions or delay costs will be allowed for delays caused by the City on paths of activities containing float, providing such delay does not exceed the float time per the latest updated version of the approved Contract Schedule.
- F. Whenever the Contractor foresees any delay in the prosecution of the Work, and in any event immediately upon the occurrence of any delay which the Contractor regards as good cause for an extension, the Contractor shall notify the Owner's Representative in writing of the delay. The notice shall specify with detail the cause asserted by the Contractor to constitute good cause for an extension together with a detailed schedule analysis showing the effect of the delay on the critical path of the Contract Schedule and a quantification of the length of the requested extension of time. Failure of the Contractor to submit such a notice within seven (7) Calendar Days after the initial occurrence of the event giving rise to the delay shall constitute a waiver by the Contractor of any request for extension, and no extension shall be granted as a consequence of such delay.
- G. The City shall have no obligation to consider any time extension request unless the Contractor has complied with the requirements of the Contract Documents, including, without limitation, giving the required seven (7) days' notice and submitting the detailed supporting schedule analysis. The City shall not be responsible or liable to the Contractor for any constructive acceleration due to failure of the City to grant time extensions under the Contract Documents, should the Contractor fail to comply with the submission and justification requirements of the Contract Documents for time extension requests. The Contractor's failure to perform in accordance with the Contract Schedule shall not be excused because the Contractor has submitted time extension requests, unless and until such requests are approved by the City.
- H. Upon receipt of a request for extension, the Owner's Representative shall conduct an investigation of the facts asserted by the Contractor to constitute good cause for an extension. The Owner's Representative shall report the results of this investigation, as well as the propriety of the time extension requested, to the Contractor in writing within ten (10) Calendar Days of receipt of the request and shall indicate whether it will recommend for or against the extension. Upon receiving the Owner's Representative's recommendation, the Contractor may either concur in the recommendation, or reject the recommendation and proceed with a notice of potential claim and claim as provided for in Article 9.

## **27. DISCRETIONARY TIME EXTENSIONS FOR BEST INTEREST OF THE CITY**

- A. The City reserves the right to extend the time for completion of the Work if the City determines that such extension is in the best interest of the City. In the event that a discretionary extension is granted at the request of the Contractor, the City shall have the right to charge to the Contractor all or any part, as the City may deem proper, of the actual cost of construction

management, engineering, inspection, supervision, incidental and other overhead expenses that accrue during the period of the extension, and to deduct all or any portion of that amount from the final payment for the Work.

- B. In the event a discretionary time extension is ordered over the objection of the Contractor, and the decision rests solely with the City and is not legally compelled for any cause, the Contractor shall be entitled to a contract change pursuant to Article 9 adjusting the price paid to reflect the actual costs incurred by the Contractor as a direct result of the delay, upon its written application therefor, accompanied with such verification of costs as the Owner's Representative requires. The decision of the City on any discretionary time extension and the costs thereof shall be final and binding.

## **28. TERMINATION FOR CONVENIENCE**

- A. The City may at any time and for any reason, terminate, in whole or in part, Contractor's Work at the City's convenience. Termination shall be by written notice to Contractor. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue Contractor's work and the placing of orders for materials, facilities and supplies in connection therewith, and shall, if requested, make every reasonable effort to procure cancellation of all existing orders or contracts upon terms satisfactory to the City, or at the option of the City, the City shall have the right to assume those obligations directly, including all benefits to be derived therefrom. Contractor hereby assigns to the City all of its interest in said orders and/or contracts, and the assignment of said orders and/or contracts shall be effective upon notice of acceptance by the City in writing, and only as to those orders and/or contracts which the City designates in writing. Following receipt of notice of termination, Contractor shall thereafter do only such work as may be necessary to preserve and protect portions of its work already in progress and to protect materials and equipment on or in transit to the Project.
- B. Upon such termination, Contractor shall be entitled to payment only as follows: (1) Contractor's direct, actual cost of the Work allocable to the portion of the Work completed in conformity with the Contract, but in no event to exceed the amount of the Contract Sum allocable to the portion of the Work completed in conformity with the Contract; plus (2) previously unpaid costs of any items delivered to the Project Site which were fabricated for subsequent incorporation in the Work, but in no event to exceed the portion of the Contract Sum allocable to said items; plus (3) an allowance of ten percent (10%) of the foregoing costs for Contractor's overhead and profit; plus (4) any proven losses with respect to materials and equipment directly resulting from the termination; plus (5) reasonable demobilization costs. The costs referred to in this Section shall be calculated and documented as required for a Change Order under Article 9 of these General Provisions, except that markup shall be only as allowed by this Section. There shall be deducted from such sums the amount of any payments made to Contractor prior to the date of the termination of this Contract. Contractor shall not be entitled to any claim or claim of lien against the City for any additional compensation or damages in the event of such termination and payment beyond that provided for in this Section.
- C. In connection with any termination for convenience, Contractor shall allow the City and any of its authorized representatives to inspect, audit, or reproduce any records to the extent necessary for the City to evaluate and verify the costs incurred by Contractor in performing the Work, including direct and indirect costs such as overhead allocations. Contractor will make this material available upon 48-hours' written notice from the City. The City may inspect and copy, from time to time and at reasonable times and places, any and all information, materials and data of every kind and character (hard copy, as well as computer readable data if it exists), including without limitation, books, papers, documents, subscriptions, recordings, estimates, price quotations, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers, monthly, quarterly, yearly or other financial statements, and any and all other information or documentation that

may, in the judgment of the City have any bearing on or pertain to any matters, rights, duties, or obligations under or covered by the Contract Documents. Such records shall include but not be limited to, the following: accounting records, payroll records, job cost reports, job cost history, margin analysis, written policies and procedures, subcontract files (contracts, correspondence, change order files, including documentation covering negotiated settlements), backcharge logs and supporting documentation, general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends, and any other documents customarily maintained by contractors performing work on public works projects or that the City otherwise deems necessary to substantiate charges related to a Termination.

- D. If this Contract is terminated for default under Section 5.25, and if it is later determined that the default was wrongful, such default termination automatically shall be converted to and treated as a termination for convenience under this Section. In such event, Contractor shall be entitled to receive only the amounts payable under this Section, and Contractor specifically waives any claim for any other amounts or damages, including any claim for consequential damages or lost profits.

## 29. TERMINATION FOR CAUSE

- A. The City may terminate the Contract, pursuant to the provisions of this Article, for the following causes:
1. The Contractor is insolvent or has made a general assignment for the benefit of creditors, or a receiver has been appointed on account of the insolvency of the Contractor.
  2. The Contractor or any of Subcontractors violate any of the provisions of the Contract Documents or fail to perform the work within the time specified in the current Contract Schedule.
  3. The Contractor or any of its Subcontractors should fail to make prompt payment to Subcontractors or material suppliers for material or for labor as required by statute.
  4. The Contractor or Subcontractor persistently disregards laws, ordinances, or the instructions of the Owner's Representative, Architect, Consulting Engineer or the City.
  5. The Contractor fails to abide by a Stop Work Notice or fails to correct rejected work or materials as required.
  6. The Contractor fails to provide and keep in full force and effect all required insurance, or fails to cause all Subcontractors to so comply.
  7. The Contractor fails to supply a sufficient number of properly skilled workers or proper materials.
  8. The Contractor commits any substantial violation of the terms and conditions of the Contract Documents which the City, in its sole discretion, finds to be a material breach of the Contract.
- B. The City The City may, without prejudice to any other right or remedy, give written notice to the Contractor and its surety or sureties of its intention to terminate the Contract.
- C. Unless within seven (7) Calendar Days of the delivery of such notice, the Contractor shall cease such violation and make satisfactory arrangements for a correction thereof, which arrangements are set forth in a written agreement signed by the Contractor and the City, the Contractor's right to complete the Work shall cease and terminate.
- D. In the event of any such termination, the City shall immediately give written notice thereof to the surety and to the Contractor and the surety shall have the rights and obligations set forth in the performance bond. If the City is forced to take over the Work, it may prosecute the same to

completion by contract or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and its sureties shall be liable to the City for any excess costs, including management, supervision, and design support, occasioned thereby. In such event, the City may, without liability, take possession of and utilize in completing the Work, the Contractor's materials whether stored at the Site or elsewhere, that are necessary for completion. Contractor hereby assigns to the City all of its interest in orders and/or contracts existing at the time of termination. The assignment of said orders and/or contracts shall be effective upon notice of acceptance by the City in writing, and only as to those orders and/or contracts which the City designates in writing. Whenever the Contractor's right to proceed is terminated, the Contractor shall not be entitled to receive any further payment until the Work is finished.

### **30. TERMINATION AFTER CONTRACT TIME**

- A. In addition to any rights it may have, the City may terminate this Contract at any time after the Contract Time, as adjusted by any extensions of time that the City may have granted.
- B. Upon such termination, in addition to the Contractor's obligations under Section 5.29 and the other provisions of the Contract Documents, the Contractor shall not be entitled to receive any compensation for services rendered before or after such termination until the Work is completed, and the Contractor shall be liable to the City for liquidated damages for all periods of time from such termination date until the Date of Completion, as well as for all losses incurred by the City in completing the Work.

### **31. INDEMNIFICATION**

- A. The Contractor shall defend, indemnify and save harmless the City, the Owner's Representative, the Architect, the Consulting Engineer and any of their respective officers, officials, agents, and employees from any and all claims, demands, damages, costs, expenses, attorney's fees, or liability arising out of or in any way connected with the performance or attempted performance of the provisions hereof, or in any way arising out of or connected with this Contract, including but not limited to, inverse condemnation, equitable relief, or any acts or omissions, any wrongful act, or any negligent act or omission to act, whether active or passive, on the part of the Contractor or any of its agents, employees, independent contractors, Subcontractors or suppliers; provided, further, without limiting the foregoing, that the indemnity is intended to apply to any wrongful acts, or any actively or passively negligent acts or omissions to act, committed jointly or concurrently by the Contractor, the Contractor's agents, employees, independent contractors, Subcontractors or suppliers, and the City, its agents, employees, or independent contractors.
- B. The indemnity obligation expressly extends to and includes, but is not limited to, any and all claims, demands, damages, costs, expenses, or liability occasioned as a result of damages to adjacent property caused by the conduct of the Work.
- C. The indemnity obligation expressly extends to and includes, but is not limited to, any and all claims, demands, damages, costs, expenses, or liability occasioned as a result of the violation by the Contractor, the Contractor's agents, employees, or independent contractors, Subcontractors or suppliers of any provisions of federal, state or local law, including applicable administrative regulations.
- D. The indemnity obligation also expressly extends to and includes, but is not limited to, any claims, demands, damages, costs, expenses, or liability occasioned by injury to or death of any person, or any property damage to property owned by any person while on or about the Site or as a result of the Work, whether such persons are on or about the Site by right or not, whenever

the Work is alleged to have been or may have been a contributing cause in any degree whatsoever.

- E. Nothing contained in the foregoing indemnity provisions shall be construed to require the Contractor to indemnify the City in contravention of Section 2782 of the Civil Code for the sole negligence or willful misconduct of the City or its agents, employees or independent contractors.
- F. In claims against any person or entity herein indemnified that are made by an employee of the Contractor or an employee of any of the Contractor's agents, independent contractors, Subcontractors or suppliers, a person indirectly employed by the Contractor or by any of the Contractor's agents, independent contractors, Subcontractors or suppliers, or anyone for whose acts the Contractor or any of the Contractor's agents, independent contractors, Subcontractors or suppliers may be liable, the indemnification obligation herein shall not be limited by any limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or the Contractor's agents, independent contractors, Subcontractors or suppliers under workers' compensation acts, disability acts, or other employee benefit acts.
- G. The indemnification obligations herein shall not be limited by any assertion or finding that the person or entity indemnified is liable by reason of a non-delegable duty.
- H. The indemnities set forth herein shall not be limited by the insurance requirements set forth in the Contract Documents.
- I. The indemnification requirements herein set forth shall extend to claims occurring after this Contract is terminated as well as while it is in force.

### 32. ASSIGNMENT

Neither this Agreement nor any rights herein of Contractor shall be assigned without the written consent of City first obtained.

### 33. AMENDMENTS

Any modification or amendment of any provision of this agreement shall be in writing and must be executed by both parties hereto.

### 34. INCIDENTAL BENEFICIARIES

It is expressly understood and agreed that the enforcement of these terms and conditions shall be reserved to City and Contractor. Nothing contained in the Agreement shall give or allow any claim or right of action whatsoever by any third person. It is the express intent of the City and Contractor that any such person or entity, other than City and Contractor, receiving services or benefits under this Agreement shall be deemed an incidental beneficiary.

### 35. MISCELLANEOUS PROVISIONS

- A. **Attorneys' Fees:** In the event an action or proceeding is instituted by either party for the breach or enforcement of any provision of this Agreement, the prevailing party shall be entitled to reasonable attorneys' fees according to law.
- B. This Agreement shall be deemed to be made in, and the rights and liabilities of the parties, and the interpretation and construction of the Agreement governed by and construed in accordance with the laws of the State of California. Any legal action arising out of this Agreement shall be filed in and adjudicated by a state court in the County of Sacramento, State of California.
- C. **Enforceability:** If any term or provision of this Agreement is found to be void, voidable, invalid or unenforceable by a court of competent jurisdiction under the laws of the State of California, any and all of the remaining terms and provisions of this Agreement shall

remain binding.

- D. **Time:** All times stated herein or in any other contract documents are of the essence.
- E. **Binding:** This Agreement shall bind and inure to the heirs, devisees, assignees and successors in interest of Contractor and to the successors in interest of City in the same manner as if such parties had been expressly named herein.
- F. **Survivorship:** Any responsibility of Contractor for warranties, insurance, indemnity, record keeping or compliance with laws with respect to this Agreement shall not be invalidated due to the expiration, termination or cancellation of this Agreement.
- G. **Waiver:** In the event that either City or Contractor shall at any time or times waive any breach of this Agreement by the other, such waiver shall not constitute a waiver of any other or succeeding breach of this Agreement, whether of the same or any other covenant, condition or obligation. Waiver shall not be deemed effective until and unless signed by the waiving party.

### 36. ENTIRE AGREEMENT

This instrument and any attachments hereto constitute the entire Agreement between the City and Contractor concerning the subject matter hereof and supersedes any and all prior oral and written communications between the parties regarding the subject matter hereof.

### 37. AUTHORITY TO EXECUTE

The person or persons executing this Agreement on behalf of the parties hereto warrants and represents that he/she/they has/have the authority to execute this Agreement on behalf of their entity and has/have the authority to bind their party to the performance of its obligations hereunder.

### 38. COUNTERPARTS

This agreement may be executed in one or more counterparts, each of which shall be deemed an original, and will become effective and binding upon the parties at such time as all of the signatories hereto have signed a counterpart of this Agreement. All counterparts so executed shall constitute one Agreement binding on all of the parties hereto, notwithstanding that all of the parties are not signatory to the same counterpart.

---

**SIGNATURE PAGE IMMEDIATELY FOLLOWS**

**IN WITNESS WHEREOF**, the parties hereto have signed the Agreement on the date set forth opposite their names.

**CONTRACTOR:**

*(Must be signed by two officers of the corporation in compliance with Corporations Code section 313.)*

_____	_____
Date	Tax I.D. Number
_____	_____
Signature	Signature
_____	_____
Print Name	Print Name
_____	_____
Title	Title

**CITY OF FOLSOM, A Municipal Corporation:**

_____	_____
Date	Elaine Andersen, City Manager
ATTEST:	FUNDING AVAILABLE:

_____	_____	_____
Christa Freemantle, City Clerk	Date	Stacey Tamagni, Finance Director

ORIGINAL APPROVED AS TO CONTENT:

ORIGINAL APPROVED AS TO FORM:

_____	_____	_____
, Director	Date	Steven Wang, City Attorney

**NOTICE: SIGNATURE(S) ON BEHALF OF CONSULTANT MUST BE NOTARIZED.**

**A certificate of acknowledgment in accordance with the provisions of California Civil Code section 1189 must be attached for each person executing this agreement on behalf of contractor. This section provides, at part (b): "Any certificate of acknowledgment taken in another place shall be sufficient in this state if it is taken in accordance with the laws of the place where the acknowledgment is made."**

**EXHIBIT A**  
**INSURANCE**

NOTE: The word "Contractor" in this Exhibit refers to either "Contractor" or "Contractor" as the term is used in the Agreement/Contract to which this Exhibit is attached.

A. During the term of this Agreement, Contractor shall maintain in full force and effect at all times during the term of the contract, at its sole cost and expense, policies of insurance as set forth herein:

1. General Liability:

- a. General liability insurance including, but not limited to, protection for claims of bodily injury and property damage liability, personal and advertising injury liability and product and completed operations liability.
- b. Coverage shall be at least as broad as Insurance Services Office Commercial General Liability coverage form CG 0001 (occurrence).
- c. Claims-made coverage is not acceptable.
- d. The limits of liability shall not be less than:

Each occurrence:	One Million Dollars (\$1,000,000)
Products & Completed Operations:	One Million Dollars (\$1,000,000)
Personal & Advertising Injury:	One Million Dollars (\$1,000,000)
- e. If a general aggregate limit of liability is used, the minimum general aggregate shall be twice the 'each occurrence' limit or the policy shall contain an endorsement stating that the general aggregate limit shall apply separately to the project that is the subject of the contract.
- f. If a products and completed operations aggregate limit of liability is used, the minimum products and completed operation aggregate shall be twice the 'each occurrence' limit or the policy shall contain an endorsement stating that the products and completed operations aggregate limit shall apply separately to the project which is the subject of the contract.
- g. If the Contractor maintains higher limits than the minimums shown above, the City requires and shall be entitled to coverage for the higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City.

2. Automobile Liability:

- a. Automobile liability insurance providing protection against claims of bodily injury and property damage arising out of ownership, operation, maintenance, or use of owned, hired, and non-owned automobiles.
- b. Coverage shall be at least as broad as Insurance Services Office Automobile Liability coverage form CA 0001, symbol 1 (any auto).
- c. The limits of liability per accident shall not be less than:

Combined Single Limit	One Million Dollars (\$1,000,000)
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- d. If Automobile Liability coverage, as required above, is provided by the Commercial General Liability form, the General Liability policy shall include an endorsement providing automobile liability as required above.
3. Workers' Compensation
  - a. Workers' Compensation Insurance, with coverage as required by the State of California (unless the Contractor is a qualified self-insurer with the State of California), and Employer's Liability coverage.
  - b. Employer's Liability Coverage with a limit not less than \$1,000,000 per accident for bodily injury and disease.
  - c. Contractor shall sign and file with the City department responsible for this Agreement/Contract the Worker's Compensation Certificate contained in the Project Manual.
4. Insurance Required in the Supplementary Conditions

Contractor shall be required to comply with all conditions as stipulated in the Standard Construction Specifications, any supplementary conditions and any special provisions as applicable.
5. Professional Liability Insurance

If required errors and omissions, malpractice or professional liability insurance with coverage of not less than \$1,000,000 per claim.
6. Other Insurance Provisions
  - a. The Contractor's General Liability and Automobile Liability policies shall contain, or be endorsed to contain, the following provisions:
    - i. The City, its officials, employees, agents and volunteers shall be covered and specifically named as additional insureds on a separate endorsement as respects liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor, premises owned, occupied, or used by the Contractor, or automobiles owned, leased, hired, or borrowed by the Contractor in a form acceptable to the City Attorney.
    - ii. The Endorsement requirement may be satisfied with express provisions in the insurance policy(ies) which identifies any person or entity required to be included as an insured under the policy. A copy of the declarations page identifying the policy number, and pertinent provisions in the policy providing additional insured coverage shall be provided to the City.
    - iii. The policy shall contain no special limitations on the scope of coverage afforded to the City, its officials, employees, agents or volunteers.
  - b. For any claims related to the project, the Contractor's General Liability and Automobile insurance coverage shall be primary insurance in their coverage of the City and its officers, officials, employees, agents, or volunteers, and any insurance or self-insurance maintained by the City, its officers, officials, employees, agents or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.
  - c. Any failure to comply with reporting or other provisions of the policies on the part of the Contractor, including breaches of warranties, shall not affect coverage provided to the City, its officers, officials, employees, agents or volunteers.

- d. The Contractor's Workers Compensation and Employer's Liability policies shall contain an endorsement that waives any rights of subrogation against the City, its officers, officials, employees, agents, and volunteers.
  - e. Each insurance policy shall state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits, non-renewed, or materially changed except after 30 days prior written notice by certified mail has been given to the City. Ten days prior written notice by certified mail shall be given to the City in the event of cancellation due to nonpayment of premium.
7. Acceptability of Insurers
- Insurance is to be placed with insurers with a **Bests' rating of no less than A:VII**.
8. The Contractor shall furnish the City with Certificates of Insurance and endorsements or insurance binders, signed by a person authorized by the insurer to bind coverage on its behalf, evidencing the coverage required by this section, the Standard Specifications, Special Provisions and/or any Supplementary Conditions. **The Contractor shall furnish complete, certified copies of all required insurance policies, including original endorsements specifically required hereunder if requested.**
9. The Contractor shall report, by telephone to the Project Manager within 24 hours, and also report in writing to the City within 48 hours, after Contractor or any Subcontractors or agents have knowledge of, any accident or occurrence involving death of or serious injury to any person or persons, or damage in excess of Ten Thousand Dollars (\$10,000) to property of the City or others, arising out of any work done by or on behalf of the Contractor as part of the contract.
10. Such report shall contain:
- a. the date and time of the occurrence,
  - b. the names and addresses of all persons involved, and
  - c. a description of the accident or occurrence and the nature and extent of the injury or damage.
11. The City, at its discretion, may increase the amounts and types of insurance coverage required hereunder at any time during the term of the contract by giving 30 days written notice.
12. If the Contractor fails to procure or maintain insurance as required by this section, the Standard Specifications, and any Supplementary Conditions, or fails to furnish the City with proof of such insurance, the City, at its discretion, may procure any or all such insurance. Premiums for such insurance procured by the City shall be deducted and retained from any sums due the Contractor under the contract.
13. Failure of the City to obtain such insurance shall in no way relieve the Contractor from any of its responsibilities under the contract.
14. The making of progress payments to the Contractor shall not be construed as relieving the Contractor or its Subcontractors of responsibility for loss or direct physical loss, damage, or destruction occurring prior to final acceptance by the City.
15. The failure of the City to enforce in a timely manner any of the provisions of this section shall not act as a waiver to enforcement of any of these provisions at any time during the term of the contract.
16. In the event Contractor carries Excess Liability Coverage, the Excess Liability Coverage shall apply to any and all claims related to the project on a primary and non-contributory

basis, and the City's insurance or self-insurance coverage shall be excess to the Contractor's Excess Liability Coverage.

SAMPLE

## PERFORMANCE BOND

BOND NO.: \_\_\_\_\_

PREMIUM: \_\_\_\_\_

### City of Folsom

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the CITY OF FOLSOM (hereinafter referred to as "CITY" ) has awarded to \_\_\_\_\_, hereinafter designated as the "Principal" a contract for \_\_\_\_\_ (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by Principal is more particularly set forth in the Contract Documents for the Project dated \_\_\_\_\_, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, said Principal is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

NOW, THEREFORE, we, the undersigned Principal and

\_\_\_\_\_ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the CITY in the sum of \_\_\_\_\_ DOLLARS, (\$ \_\_\_\_\_), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if said Principal, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the two-year guarantee of all materials and workmanship; and shall indemnify and save harmless the CITY, its officers and agents, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees including reasonable attorneys' fees, incurred by CITY in enforcing such obligation.

The obligations of Surety hereunder shall continue so long as any obligation of Principal remains. Nothing herein shall limit the CITY's rights or Principal's or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure section 337.15.

Whenever Principal shall be, and is declared by the CITY to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the CITY's option:

(1) Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

(2) Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a Contract between such bidder, the Surety and the CITY, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Principal by the CITY under the Contract and any modification thereto, less any amount previously paid by the CITY to Principal and any other set offs pursuant to the Contract Documents.

(3) Permit the CITY to complete the Project in any manner consistent with California law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Principal by the CITY under the Contract and any modification thereto, less any amount previously paid by the CITY to Principal and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the CITY may reject any design-builder, contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by Principal. Surety shall not utilize Principal in completing the Project nor shall Surety accept a bid from Principal for completion of the Project if the CITY, when declaring Principal in default, notifies Surety of the CITY's objection to Principal's further participation in the completion of the Project.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed there under shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this \_\_\_\_\_ day of \_\_\_\_\_, 2014, then names and corporate seals of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to the authority of its governing body.

Principal: \_\_\_\_\_

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

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

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

APPROVED AS TO FORM

\_\_\_\_\_  
City Attorney

Telephone: \_\_\_\_\_

Attorney in Fact: \_\_\_\_\_

**(Attach Attorney-In-Fact Certificate, Corporate Seal and Surety Seal. This bond must be accompanied by a current Power of Attorney Appointing the Attorney-in-Fact)**

**NOTICE:**

**A CERTIFICATE OF ACKNOWLEDGMENT IN ACCORDANCE WITH THE PROVISIONS OF CIVIL CODE SECTION 1189 MUST BE ATTACHED FOR EACH PERSON EXECUTING THIS AGREEMENT ON BEHALF OF PRINCIPAL AND SURETY.**

## PAYMENT BOND

BOND NO.: \_\_\_\_\_

PREMIUM: \_\_\_\_\_

### City of Folsom

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the CITY OF FOLSOM (hereinafter referred to as "CITY") has awarded to \_\_\_\_\_, (hereinafter designated as "Principal") an agreement for \_\_\_\_\_ (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by Principal is more particularly set forth in the Contract Documents for the Project dated \_\_\_\_\_, (hereinafter referred to as the "Contract"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, said Principal is required to furnish a bond in connection with said Contract providing that if Principal or any of its subcontractors shall fail to pay for any materials, provisions, or 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 the Surety on this bond will pay the same together with a reasonable attorney's fee in case suit is brought on the bond.

NOW, THEREFORE, we, the undersigned Principal and

\_\_\_\_\_ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the CITY in the sum of \_\_\_\_\_ DOLLARS, (\$\_\_\_\_\_), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Principal, his or its subcontractors, heirs, executors, administrators, successors, or assigns, shall fail to pay for any materials, provisions, or other supplies or machinery used in, upon, for or about the performance of the Work contracted to be done, or for work or labor thereon of any kind, or fail to pay any of the persons named in California Civil Code Section 9100, or amounts due under the Unemployment Insurance Code with respect to work or labor performed by any such claimant, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of Principal and his subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work and labor, and all other applicable laws of the State of California and rules and regulations of its agencies, then said Surety will pay the same in or to an amount not exceeding the sum specified herein. In case legal action is required to enforce the provisions of this bond, the prevailing party shall be entitled to recover reasonable attorneys' fees in addition to court costs, necessary disbursements and other consequential damages. In addition to the provisions hereinabove, it is agreed that this bond will inure to the benefit of any and all persons, companies and corporations entitled to make claims under Section 9100 of the California Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or additions to the terms of the said Contract or to the work to be performed thereunder or the specification accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this \_\_\_\_\_ day of \_\_\_\_\_, 2014, then names and corporate seals of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to the authority of its governing body.

Principal: \_\_\_\_\_

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

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

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

Telephone: \_\_\_\_\_

Attorney in Fact: \_\_\_\_\_

APPROVED AS TO FORM

\_\_\_\_\_  
City Attorney

**(Attach Attorney-In-Fact Certificate, Corporate Seal and Surety Seal. This bond must be accompanied by a current Power of Attorney Appointing the Attorney-in-Fact)**

**NOTICE:**

**A CERTIFICATE OF ACKNOWLEDGMENT IN ACCORDANCE WITH THE PROVISIONS OF CIVIL CODE SECTION 1189 MUST BE ATTACHED FOR EACH PERSON EXECUTING THIS AGREEMENT ON BEHALF OF PRINCIPAL AND SURETY.**

## GUARANTEE

\_\_\_\_\_ (hereinafter called "Contractor") hereby guarantees the work to be performed (hereinafter called "Work") for the \_\_\_\_\_ (hereinafter called "Project") as set forth herein.

Contractor shall complete the work for the City of Folsom (hereinafter called "City") in accordance with the requirements of the Construction Agreement (hereinafter called "the Agreement").

Contractor guarantees the Work for a period of two (2) years from and after recordation of the Notice of Completion of the Project and completion of all contractual obligations by Contractor, including formal acceptance of the entire Project by the City, unless a longer guarantee period is set forth in the Agreement, in which case the terms of the Agreement shall govern. Contractor specifically waives any right to claim or rely on the statutory definition of completion set forth in Civil Code section 3086. Contractor specifically acknowledges and agrees that completion shall mean Contractor's complete performance of all Work required by the Contract Documents, amendments, change orders, construction change directives, or punch lists, and the City's formal acceptance of the entire Project, without regard to prior occupancy, the substantial completion doctrine, beneficial occupancy, or otherwise.

Within the guarantee period specified, Contractor shall repair or replace any and all Work that may be defective in its workmanship or materials or that may not have been completed in accordance with the terms of the Agreement, together with anything damaged or displaced in so doing, without any cost or expense whatsoever to the City, ordinary wear and tear and/or unusual abuse or neglect excepted. Contractor has provided contract bonds which shall remain in full force and effect during the guarantee period.

The guarantee period for corrected Work shall continue for a duration equivalent to the original guarantee period.

This guarantee is provided in addition to, and not in lieu of, the City's rights to enforce the Agreement in all respects.

Signed:

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

Dated:

\_\_\_\_\_

**NOTICE: SIGNATURE(S) ON BEHALF OF CONTRACTOR MUST BE NOTARIZED**

Certificate of Acknowledgement pursuant to Civil Code Section 1189 must be attached.



Escrow No.

## **ESCROW AGREEMENT FOR DEPOSIT OF SECURITIES IN LIEU OF CASH RETENTION**

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, by and between the \_\_\_\_\_, a political subdivision of the State of California (hereinafter referred to as Owner), \_\_\_\_\_ (hereinafter referred to as Contractor), and \_\_\_\_\_, a state or federally chartered bank (hereinafter referred to as Escrow Agent).

WHEREAS, California Public Contract Code, Section 22300 provides that a Contractor on a Public Works contract may deposit with an escrow agent securities having a value equivalent to or greater than the amount to be held by the public agency owner for retention payments, and, under appropriate circumstances, receive the withheld retention payments;

NOW, THEREFORE, in consideration of the mutual promises herein contained, the parties hereto agree as follows:

1. Owner has let to Contractor Contract No. \_\_\_\_\_, for the construction of \_\_\_\_\_, said construction contract being dated \_\_\_\_\_. That said construction contract provides that the Owner shall retain from each progress payment a specified portion of the progress payment until the lapse of a specified period of time following acceptance by the Owner of the completed construction project. That said construction contract further provides that the Contractor may substitute a deposit of securities in lieu of the Owner withholding such monies from the total amount of the performance by the Contractor provided such deposit of securities complies with the terms of the Construction contract and law. That said construction contract and law alternately provides that the owner may make payment of retentions earned directly to the escrow agent after Contractor request.

2. Contractor may deposit with Escrow Agent securities eligible for investment under California Public Contract Code, Section 22300 as security in lieu of any monies withheld by the Owner to ensure performance under the aforesaid construction contract. Alternately, the owner may make payment of retentions earned directly to the Escrow Agent after contractor request. Such direct payment of retentions earned shall hereinafter be included in the term "securities".

3. Escrow Agent shall, upon deposit by the Contractor of eligible securities, determine the value of the securities so deposited and certify in the form attached as Exhibit "A" to the Department of Public Works, City of Folsom, 50 Natoma Street, Folsom, California 95630 that eligible securities have been deposited with the Escrow Agent by the Contractor on account for release of retention by the City of monies withheld to ensure performance of the aforesaid construction contract. Such certification shall state minimum value of the securities. The securities shall not be released by the Escrow Agent until the City Public Works Director (hereinafter referred to as Engineer) has instructed the Escrow Agent in writing that the said securities may be released to the Contractor. The form of such instruction in writing is annexed hereto as Exhibit "B".

4. Escrow Agent shall hold the aforesaid securities until such time Escrow Agent is instructed in writing by the Owner's Engineer that Escrow Agent may release the securities to the Contractor. In the event the Owner's Engineer submits a written demand and certification, in the form attached hereto as Exhibit "C", stating that the Contractor has failed to perform all or part of the construction agreement after notice and demanding the payment of a specified amount of cash to be delivered by the Escrow Agent to the Owner, the Escrow Agent shall, seven (7) days following receipt of such demand and certification, cause sufficient of the securities deposited by Contractor to be sold and shall immediately deliver to the Owner's Engineer the amount of cash specified in the said demand and certification. No proof or documents, other than the demand and certification, shall be required of the Engineer by the Escrow Agent in order to accomplish the sale and delivery as specified herein. Any excess cash or securities remaining after satisfaction of the Engineer's demand shall be retained by the Escrow Agent until further instructed by the Engineer.

5. Upon receipt by Owner of an appropriate certification as set forth in Paragraph 3 above, Owner shall release to Contractor all monies withheld by Owner to ensure performance of the aforesaid construction contract, but only to the extent that such monies have been earned by the Contractor and do not exceed the value of the securities deposited as set forth in the certification. Further, Owner shall not release to the Contractor any monies required to be withheld pursuant to a valid stop notice filed by any person so authorized and with respect to the said construction contract. Owner shall be the sole judge of the validity of all such stop notices and shall retain one hundred percent (125%) of the amount claimed in the stop notice. At such time as in the opinion of the Owner's Engineer, the Contractor has failed to perform all or part of the construction agreement, the Engineer may give 10 days' written notice to the Contractor to adequately commence or complete such performance, or the Engineer shall make demand upon the Escrow Agent for sale of securities deposited by the Contractor and for the delivery of cash proceeds to the Engineer. Upon failure of the Contractor to adequately commence or complete performance within the time specified by the Engineer, the Engineer may submit to the Escrow Agent a written demand and certification in the form attached hereto as Exhibit "C", specifying the amount to be paid to the Owner, and the Escrow Agent shall comply with the terms thereof. The Owner's Engineer shall be the sole judge of the failure of performance by the Contractor, the adequacy of

commencement or completion of performance by the Contractor and the value of the failure of performance by the Contractor.

6. This escrow agreement is a third party beneficiary contract to the extent that it provides security to the Owner. The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon. The Owner shall have the right to have any such securities sold by the Escrow Agent and the cash value thereof delivered to the Owner as set forth above. In the event the sale of the securities does not realize sufficient cash to pay to the Owner the amount demanded by the Engineer, Contractor shall be obligated to immediately pay to the Owner any deficiency, and the Owner shall be further entitled to withhold any such deficiency from any payments then due from the Owner to the Contractor or to become due.

7. Contractor shall pay all fees and costs required to establish and maintain the escrow and to carry out the terms of this agreement.

8. Both the Contractor and the Escrow Agent shall indemnify and hold harmless the Owner from any loss suffered by the Owner as a result of any act or omission of Escrow Agent or Contractor or any of their officers, employees, or agents. Further, the Contractor shall indemnify and hold harmless the Owner from any loss suffered by the Owner resulting from the acts or omissions of the Escrow Agent or any of its officers, employees, or agents. Further, the Contractor shall indemnify and hold harmless the Escrow Agent from any loss The Escrow Agent may suffer as a result of the acts or omissions of the Contractor or any of its officers, employees, or agents.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above stated.

\_\_\_\_\_  
a political subdivision of the State of California

By \_\_\_\_\_  
OWNER

\_\_\_\_\_  
CONTRACTOR

\_\_\_\_\_  
ESCROW AGENT

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

Address

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NOTICE: SIGNATURE(S) ON BEHALF OF "SUBDIVIDER" MUST BE NOTARIZED

Certificate of Acknowledgement pursuant to Civil Code, Section 1189, must be attached.

## **"EXHIBIT A"**

To: Department of Public Works  
Escrow #  
City of Folsom  
50 Natoma Street  
Folsom, CA 95630

Re: CERTIFICATION OF DEPOSIT OF SECURITIES

\_\_\_\_\_, as Escrow Agent in that certain Escrow Agreement for Deposit of Securities in Lieu of Cash Retention on Public Works Project between the City of Folsom (referred to as City), \_\_\_\_\_ (referred to as Contractor and \_\_\_\_\_, a state or federally chartered bank (referred to as Escrow Agent), dated \_\_\_\_\_, hereby certifies to the City of Folsom that the said Escrow Agent has received from the specified Contractor, securities eligible for investment of not less than \$\_\_\_\_\_. The said Escrow Agent agrees to hold said securities in accordance with the term of the aforesaid escrow agreement, and shall not release the said securities to the said Contractor until such time as the said Escrow Agent has received notification from the City Public Works Director that the construction contract has been accepted the Escrow Agent further certifies that written demand by the City Public Works Director the Escrow Agent shall cause sufficient securities to be sold from those so deposited by the said Contractor and shall pay to the City the amount specified in the demand, provided such demand does not exceed the amount specified as the minimum value of the securities herein.

Dated: \_\_\_\_\_ at \_\_\_\_\_, California.

\_\_\_\_\_,  
a state or federally chartered bank

By \_\_\_\_\_  
Escrow Agent

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

Address \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## EXHIBIT B

Escrow #

To: Escrow Agent

Re: AUTHORIZATION TO RELEASE SECURITIES DEPOSITED BY CONTRACTOR

You, as Escrow Agent in that certain Escrow Agreement for Deposit of Securities in Lieu of Cash Retention on Public Works project between the \_\_\_\_\_, a political subdivision of the State of California (referred to as Owner), \_\_\_\_\_, (referred to as Owner), and \_\_\_\_\_, a state or federally chartered bank (referred to as Escrow Agent), dated \_\_\_\_\_ are hereby authorized to release to the aforesaid Contractor all securities deposited with you with respect to the aforesaid escrow agreement, except that you shall be required to retain as security and pursuant to the terms of the said escrow agreement securities having a value of not less than \$\_\_\_\_\_, until such time as you may be further notified by the Owner's Engineer as to further release or as to sale.

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

\_\_\_\_\_,  
a political subdivision of the State of California

By \_\_\_\_\_  
Engineer

OWNER

## EXHIBIT C

Escrow #

### NOTIFICATION OF FAILURE OF PERFORMANCE DEMAND FOR SALE OF SECURITIES AND DEMAND FOR PAYMENT

You, as Escrow Agent in that certain Escrow Agreement for Deposit of Securities in Lieu of Cash Retention on Public Works Project between the \_\_\_\_\_, a political subdivision of the State of California (referred to as Owner), \_\_\_\_\_ (referred to as Contractor) and \_\_\_\_\_, a state or federally chartered bank (referred to as Escrow Agent), dated \_\_\_\_\_, are hereby notified that the said Contractor has failed to perform all or part of that certain construction contract described in the said escrow agreement after having been given written notice of lack of performance. You are hereby directed to cause to be sold securities deposited by the said Contractor with you and in accordance with the escrow agreement, said securities having a minimum value of \$\_\_\_\_\_, and to deliver forthwith to the Owner's Engineer the sum of \$\_\_\_\_\_. Any remaining securities deposited pursuant to the terms of the said escrow agreement shall be retained by you pursuant to further written notice by the City of Folsom Public Works Director.

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

\_\_\_\_\_,  
a political subdivision of the State of California

By \_\_\_\_\_  
Engineer

OWNER

## **GENERAL PROVISIONS**



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## PREFACE

The General Provisions and all portions of the Standard Construction Specifications, Standard Forms Specifications and Standard Drawings which place any duty or responsibility upon personnel or agencies of the City of Folsom or other public entities are intended for use in those contracts entered into by public entities and administered by the City of Folsom. Any use of these General Provisions and the Standard Construction Specifications, Standard Forms Specifications, and Standard Drawings by any other person, persons, or entity shall not create or imply the assumption of any liability or responsibility by the City of Folsom or any public entity authorized to use these specifications.

Unless otherwise excluded, the Standard Construction Specifications, Section 1 through Section 12, shall apply to all materials and construction methods for all construction work both under the direct inspection of the City of Folsom for contracts awarded by public entities and administered and inspected by the City of Folsom, and for those contracts under indirect inspection awarded by other parties for future dedication or incorporation into the public entities' facilities, and for construction of private improvements within public rights of way or easements.

In addition to public contracts, the Standard Construction Specifications of this document will also apply to private development both for publicly owned and privately owned facilities.

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## **GENERAL PROVISIONS**



## ARTICLE 1. TERMS AND DEFINITIONS

Section 1.01. Whenever the following terms, titles, abbreviations or phrases are used in these Specifications, or in any document or instrument wherein these Specifications govern, the intent and meaning thereof shall be as defined in this Article.

### Section 1.02. Abbreviations.

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
APA	American Plywood Association
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWS	American Welding Society
AWWA	American Water Works Association
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CL	Centerline
CSI	Construction Specifications Institute
CY	Cubic Yards
DI	Drop Inlet
EA	Each
EP	Edge of Pavement
FS	Federal Specifications
In	Invert
ISA	Instrument Society of America
LB	Pound
LF	Linear Feet
LS	Lump Sum
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCC	Portland Cement Concrete
SD	Storm Drain
SF	Square Foot/Feet
SS	Sanitary Sewer
STA	Station
Title 8	Title 8 (Construction Safety Orders) of the California Code of Regulations
Title 19	(Public Safety) of the California Code of Regulations
Title 24	Title 24 (Building Standards) of the California Code of Regulations
TOC	Top of Curb
Typ.	Typical
UL	Underwriters' Laboratories, Inc.

UBC	Uniform Building Code (latest edition)
USBR	United States Bureau of Reclamation
UMC	Uniform Mechanical Code (latest edition)
UPC	Uniform Plumbing Code (latest edition)
WCLA	West Coast Lumbermen's Association
WIC	Woodwork Institute of California

All references to the specifications, standards or other publications of any of the above are understood to refer to the current issue as revised or amended at the date of receipt of bids.

Section 1.03. Addendum/Addenda.

"Addendum" or "Addenda" are written documents furnished by the City before award of the Contract, interpreting or modifying Plans and Specifications or answering questions of intended bidders, and shall be incorporated in and are a part of the Contract Documents.

Section 1.04. Allowance.

"Allowance" shall mean an amount of money set aside under the Contract for a special purpose identified in the Contract Documents.

Section 1.05. Architect and/or Consulting Engineer.

The "Architect" or "Consulting Engineer" is a person or persons, firm, partnership, joint venture corporation, or combination thereof or authorized representative thereof, employed by the City or acting in the capacity of consultant to the City. The Architect or Consulting Engineer is designated by the City as the City's agent to perform all functions delegated to the Architect or Consulting Engineer by the Contract Documents. The Architect or Consulting Engineer shall issue directions to the Contractor only through the City. When the Contract Documents require that approval be obtained from the Architect or Consulting Engineer, such approval shall be requested from and be given by the City.

Section 1.06. As Shown Etc.

Where "as shown", "as latest indicated", "as detailed", or words of similar import are used, the reference is to the Contract Drawings unless specifically stated otherwise. Where "as directed", "as permitted", "approved", or words of similar import are used, they shall mean the direction, permission, or approval of the City.

Section 1.07. Bid.

When submitted on the prescribed bid form, properly executed and bonded, at the designated time and location, the "Bid" constitutes the offer of the Bidder to complete the Work for the price stated on the bid form.

Section 1.08. Bidder.

"Bidder" shall mean any person or persons, firm, partnership, joint venture, corporation, or combination thereof, submitting a Bid for the Work, acting directly or through a duly authorized representative.

Section 1.09. Calendar Day.

"Calendar Day" shall mean every day shown on the calendar. When the Contract Time is stated in Calendar Days, every day will be charged toward the Contract Time, and every reference to Working Days in these Specifications shall be deemed to mean Calendar Days.

Section 1.10. Change Order.

“Change Order” shall mean a written order to the Contractor, issued after execution of the Contract, signed by the City and the Contractor, authorizing a change in the Work and/or an adjustment in the Contract Sum and/or the Contract Time.

Section 1.11. City.

“City” shall mean the municipal corporation known as the City of Folsom. The City is sometimes designated “Owner” in the Contract Documents.

Section 1.12. City Council.

“City Council” shall mean the City Council of the City of Folsom.

Section 1.13. Closeout Documents.

“Closeout Documents” are the documents that are required to meet the requirements of final completion.

Section 1.14. Construction Change Directive (CCD).

“Construction Change Directive”, or “CCD”, shall mean a written order to the Contractor, issued after execution of the Contract, signed by the City or the Owner’s Representative directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both, and which shall be used in the absence of total agreement with the Contractor on the terms of a Change Order or when time does not permit processing of a Change Order prior to implementation of the change.

Section 1.15. Contract Documents.

The “Contract Documents” shall include the Notice to Contractors, the Proposal Form, the Agreement for Construction, the Bid Bond, the Performance Bond, the Payment Bond, these Standard Construction Specifications, the Special Provisions, Exhibits, the Contract Drawings and Plans, the Technical Specifications, any project-specific specifications or documents, all duly issued Addenda, Interpretations, Field Instructions, Written Directives, Supplemental Drawings, the Contractor’s Guarantee and Bond, the Contract Schedule, Storm Water Pollution Prevention Plan (whether prepared by the City or the Contractor) and any and all supplemental agreements amending or extending the Work contemplated and which may be required to complete the Work in an acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the Contract Documents and include Change Orders

Section 1.16. Contract Drawings or Plans.

The “Contract Drawings” (sometimes referred to as “Drawings” or “Plans”) are the Project Plans, Standard Drawings, drawings, profiles, typical cross sections, general cross sections, Working Drawings and supplemental drawings, plates or reproductions thereof, approved by the City, which show the locations, character, dimensions and details of the Work to be performed. Once approved, all such drawings are incorporated into and become a part of the Contract Documents whether or not reproduced in the Special Provisions.

In the above definition, the following terms are defined as follows:

A. Standard Drawings: The Standard Drawings of the City of Folsom.

B. Project Plans: The project plans and specific details and dimensions peculiar to the Work and as supplemented by the Standard Drawings insofar as the same may



apply.

Section 1.17. Contract Schedule.

The “Contract Schedule” is the schedule produced by the Contractor in response to the requirements of the Contract Documents.

Section 1.18. Contract Sum.

“Contract Sum” is the total amount payable by the City to the Contractor for the performance of the Work under the Contract Documents. The Contract Sum is the amount stated in the Agreement for Construction, including authorized adjustments thereto.

Section 1.19. Contract Time.

“Contract Time” shall mean the period specified for completion of the Work, as set forth in the Agreement for Construction and adjusted by any Change Order issued pursuant to the Contract Documents. The Contract Time may be a single allotment of time, a group of times specific to portions of the Work, or a combination of the two.

Section 1.20. Contractor.

“The Contractor” shall mean the person or persons, firm, partnership, joint venture, corporation, or combination thereof, who (that) has (have) entered into the Agreement for Construction of the Work with the City or its (their) legal representatives, or successors, assigns, executors, or heirs. The Contractor is required by law to be licensed and will perform work or render services as a prime contractor in or about the construction of the Work.

Section 1.21. Date of Commencement

“Date of Commencement” is the date established in the Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the executed Agreement for Construction or such other date as may be established therein.

Section 1.22. Date of Completion.

The “Date of Completion” for the purpose of determining when the Work is complete is the date certified by the Owner’s Representative when construction of the Work is 100% complete, including completion and acceptance of all punch list corrections. See Article 7, Section 7.30 and Article 8, Section 8.11 for the meaning of “completion” for the purpose of determining acceptance of the Work and when final payment is due.

Section 1.23. Director.

The “Director” is the person appointed by the City Manager for the City of Folsom for the department through which the Project will be procured.

Section 1.24. Engineer.

The “Engineer” is the Director of Public Works/City Engineer of the City of Folsom, acting personally or through agents or assistants duly authorized to manage the Project by the overseeing Department Director.

Section 1.25. Equal (as in “or equal”).

“Equal” shall mean a system, process, product or material which is similar in all respects to that shown or specified but produced by a manufacturer not listed in the specification. See also: Substitution.

Section 1.26. Estimated Quantities.

“Estimated Quantities” shall mean a list of items of work and the estimated quantities associated with the Work. The Estimated Quantities may provide the basis for the Bid

Section 1.27. Field Instructions/Written Directives.

“Field Instructions/Written Directives” are Supplemental Drawings or instructions which may be issued as necessary from time to time to make clear or define in greater detail the intent of the Contract Drawings and Specifications. There may be a change in Contract Sum or Contract Time involved with the work shown in the Field Instruction/Written Directive.

Section 1.28. First Line Supervision.

“First Line Supervision” shall mean a working foreman or lead craft worker other than the project superintendent.

Section 1.29. Inspector.

The “Inspector” is the person or persons authorized to act as agent(s) for the City in the inspection of the Work.

Section 1.30. Interpretations.

The “Inspector” is the person or persons authorized to act as agent(s) for the City in the inspection of the Work.

Section 1.30. Interpretations.

“Interpretations” are all clarifications, additional instructions, and explanations issued by the Architect or Consulting Engineer after award of the Contract.

Section 1.31. Materials.

“Materials” is a generic term which shall include all materials, articles, supplies, and equipment delivered to the project for incorporation in the Work. “Materials” includes everything incorporated into the Work except labor, unless otherwise noted. “Equipment” shall mean all pre-manufactured or partially preassembled products or components, assembled or partially assembled before delivery to the Site.

Section 1.32. Notice to Contractors.

“Notice to Contractors” is the written notice whereby interested parties are informed of the date, location, and time of the Bid opening of a proposed City Project and the terms and conditions of submitting Bids to perform the Work.

Section 1.33. Notice to Proceed.

“Notice to Proceed” is the notice given to the Contractor following execution of the Agreement for Construction and receipt of all required preconstruction submittals as itemized in the Contract Documents. The Notice to Proceed establishes the start of the Work and authorizes the Contractor to begin construction.

Section 1.34. Owner’s Representative.

“Owner’s Representative” shall mean the City’s designated agent engaged to perform all functions delegated to the Owner’s Representative by the Contract Documents. The Owner’s Representative may or may not be a construction manager. The Owner’s Representative will be the Contractor’s primary contact during construction of the Project.

Section 1.35. Plans.

See "Contract Drawings".

Section 1.36. Product Data.

"Product Data" shall mean illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

Section 1.37. Project

"Project" shall mean the complete work of improvement referenced in the Contract Documents.

Section 1.38. Proposal.

"Proposal" shall mean "Bid".

Section 1.39. Proposed Change Order (PCO).

A "Proposed Change Order/Work Order" or "PCO" is the name given to a document issued by the Contractor proposing a change to the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. A PCO shall be used by the Contractor to respond to a Request for Proposal. A PCO is not effective to authorize the proposed change to the Work, to the Contract Sum or to the Contract Time unless it is accepted in writing by the City.

Section 1.40. Record Documents.

"Record Documents" (sometimes referred to as as-builts) are the drawings and specifications prepared by the Contractor that document changes to, additions to, or deductions from the Plans and Specifications, and which represent the Work as constructed.

Section 1.41. Reference to Codes.

Unless otherwise noted, all references to statutes are to the laws of the State of California and/or of the United States as codified in the various specified codes.

Section 1.42. Request for Information.

"Request for Information", or "RFI" is the name given to a document issued by the Contractor seeking clarification and/or additional information regarding an aspect of the Work. The response to the RFI does not constitute authorization or direction to proceed with any changed or additional work. Changed or additional work must be separately authorized by the City.

Section 1.43. Request for Proposal (RFP).

A "Request for Proposal", or "RFP" is the name given to a document issued by the Owner's Representative requesting pricing information and/or an adjustment in Contract Time for a described scope of work. An RFP is not a Change Order, a CCD or a direction to proceed with the scope of work described in the RFP. The Contractor's response to the RFP shall be in the form of a Proposed Change Order.

Section 1.44. Samples.

"Samples" shall mean physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

Section 1.45. Schedule of Values.

The "Schedule of Values" is a statement furnished by the Contractor to the City reflecting the

portions of the Contract Sum allotted for the various parts of the Work for each work activity contained on the Contract Schedule. Unless otherwise indicated in the Specifications, the total of the Schedule of Values shall equal the full cost of the Work, including all labor, material, equipment, overhead, and profit. For lump sum contracts, the Schedule of Values is the basis for reviewing the Contractor's application for progress payments.

Section 1.46. Shop Drawings.

"Shop Drawings" shall mean drawings, diagrams, schedules and other data specifically prepared by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

Section 1.47. Site.

"Site" is the area within which the Project is to be constructed.

Section 1.48. Special Provisions.

The "Special Provisions" are specific clauses setting forth conditions or requirements peculiar to the Work and supplementary to these Standard Construction Specifications.

Section 1.49. Standard Construction Specifications.

The "Standard Construction Specifications" include the directions, provisions, and requirements contained herein. When the term "Standard Specifications", "Specifications", or "these Specifications" is used, it means the provisions as set forth herein, together with any amendments or revisions that may be set forth in the Special Provisions. The Standard Specifications are comprised of "General Provisions" and "Standard Technical Provisions".

Section 1.50. Standard Drawings.

The "Standard Drawings" are the Standard Drawings of the City, which are incorporated into the Standard Construction Specifications, and made a part of the Plans by reference to one or more specific Standard Drawings.

Section 1.51. State.

"State" shall mean the State of California.

Section 1.52. State Specifications.

"State Specifications" shall mean the version of the Standard Specifications of the State of California, Department of Transportation, in effect at the time of Notice to Contractors.

Section 1.53. State Plans.

"State Plans" shall mean the version of the Standard Plans of the State of California, Department of Transportation, in effect at the time of Notice to Contractors.

Section 1.54. Subcontractor.

"Subcontractor" shall mean each person or firm who is required by law to be and who is licensed to and will perform work, labor, or render services to the Contractor in or about the construction of the Work, or who, under subcontract to the Contractor, fabricates and installs a portion of the Work. Subcontractor includes a properly licensed party under contract and responsible to a Subcontractor of the Contractor.

"Subcontractor" shall include all persons or firms within the authority of the Subletting and Subcontracting Fair Practices Act, Chapter 2 of Division 5, Title I of the Public Contract Code,

commencing with section 4100.

Section 1.55. Submittal.

“Submittal” shall mean all product data, shop drawings, manufacturers’ instructions, samples, Equals, substitution requests and all other submissions that the Contractor is required to provide to the City and/or the Architect or Consulting Engineer.

Section 1.56. Substitution.

“Substitution” shall mean a system, process, product or material similar in form or function and equal in quality and performance to that shown or specified, but differing in some essential element, e.g., chemical composition, mechanism of action, surface finish, dimensions, durability, electrical or mechanical or plumbing requirements. See also: Equal.

Section 1.57. Supplemental Drawing.

“Supplemental Drawings” define the Plans or Specifications in greater detail by providing additional information that may have not been specifically or clearly shown or called out on the Plans or in the Specifications.

Section 1.58. Work.

The “Work” shall mean all actions which the Contractor is contractually required to do as specified, indicated, shown, contemplated, or implied in the Contract to construct the Work, including all alterations, amendments, or extensions made by Contract Change Order or other written orders or directives of the City. Unless specified otherwise in the Contract, the Work includes furnishing all materials, supplies, equipment, tools, labor, transportation, supervision, and all incidentals necessary to complete the Work. The Work generally is described in the Notice to Bidders and the Special Provisions.

Section 1.59. Working Day.

“Working Day” means any day except: (a) Saturdays, Sundays, and City holidays; (b) days in which the Contractor is specifically required by the Special Provisions or by law to suspend construction operations; or (c) days on which the Contractor is prevented from proceeding with the current controlling operation or operations of the Work for at least five (5) hours per day due to inclement weather, or conditions resulting immediately therefrom.

Section 1.60. Working Drawing.

“Working Drawings” detail a particular item of work and the manner in which it is to be accomplished or performed. Working Drawings are prepared by the Contractor as a submittal or a portion of a submittal and may be specifically requested by the City or required in the Contract or a Written Directive.

## ARTICLE 2. BID REQUIREMENTS AND CONDITIONS

### Section 2.01. Bid Form.

The City will furnish to each prospective Bidder a bid form which, when properly completed and executed, must be submitted as the Bidder's Bid for the Work. All Bids must be submitted on the City-furnished bid form to be valid and accepted. Bids that are not submitted on the City-furnished bid form will be rejected. The completed bid form shall be in English and legible, and shall be properly signed in longhand; by the Bidder, if an individual, by a member of a partnership, by an officer of a corporation authorized to sign contracts on behalf of the corporation, or by an agent of the Bidder. If submitted by a corporation, the Bid shall show the name of the state under the laws of which the corporation is chartered or organized.

All spaces provided on the bid form shall be filled in. If any space provided is not utilized by the Bidder, that space shall be filled in with the notation "NA" (Not Applicable).

The bid form shall be filled in by typewriter or manually printed in ink.

Bidders shall not make unsolicited notations or statements on the bid form. Alteration of the bid form is not permitted and will result in the Bid being considered non-responsive. All changes to and erasures or crossing out of the Bidder's entries shall be initialed by the signer of the bid form.

The Bid shall be made on the bid form in clearly legible figures as follows:

#### A. Unit Price Bid.

Where the bid for an item of work is to be submitted on a unit price basis, the Bidder shall bid a unit price as total compensation for completion of one unit of the work described under that item. This price shall be multiplied by the Estimated Quantity included in the bid form to derive a total bid price for that item. In the case of a discrepancy between the total bid price for an item of work and the unit price for that item of work, the unit price will control. The total amount bid for a unit price contract shall be entered on the space provided on the bid form as a grand total of all individual items. In the case of a discrepancy between the total amount bid for the contract and the actual sum of the bid price for all of the individual items of work, the actual sum will control. The Estimated Quantities included on the bid form are approximate and are only included in the bid form as a basis for comparison of Bids. The City does not, expressly or by implication, represent or agree that the actual amount of work will equal the approximate Estimated Quantities. Payment will be made for the actual quantity of Work performed in accordance with the Contract, at the unit price stated in the bid form. The City 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 advisable in the sole discretion of the City. For compensation for alterations in quantities of work, including deviations greater than twenty-five percent (25%), see Section 9.04B, "Pricing of Changes – Unit Prices", of these General Provisions.

#### B. Lump Sum Bid.

Where the bid for an item of work is to be submitted on a "Lump Sum" or "Job" basis, a single lump-sum price shall be submitted in the appropriate place on the bid form. Items bid on a lump-sum basis shall result in a complete structure, operating plant, or system, in satisfactory working condition with respect to the functional purposes of the installation, as described in the Contract, and no extra compensation will be paid for



anything omitted but fairly implied.

C. Allowances.

Where specific allowance items have been entered on the bid form by the City, the total amount entered on the bid form shall be included in the Total Bid Price. However, the total amount to be paid for the Work included in the Allowance shall be the amount of the Allowance actually utilized in the course of completing the Work.

D. Alternates.

Alternate bids are sums which may be added to or deleted from the base bid amount for the performance of alternate work, as delineated in the Notice to Contractors. All requested Alternates shall be bid, or the Bid shall be considered incomplete.

See also Article 3, Section 3.01 regarding resolution of discrepancies in amount of bid items.

Section 2.02. Preparation and Submission of Bids.

By submission of a Bid, the Bidder acknowledges acceptance of the nature and location of the Work, the general and local conditions, conditions of the Site, the character, quality and scope of work to be performed, the availability of labor, electric power, water, the kind of surface and subsurface materials on the site, the materials and equipment to be furnished, and all requirements of the Contract or other matters which may affect the Work or the cost. Any failure of a Bidder to become acquainted with all of the available information concerning conditions will not relieve the Bidder from the responsibility for observing and considering those conditions that a contractor would have observed and considered during a site visit, estimating properly the difficulties or cost of the Work, or proceeding to perform the Work without additional cost to the City. Further, on the basis of the above information and any further examinations, investigations and studies that the Bidder has made in connection with the Work, the Bidder represents and agrees, by submission of a Bid, that the Plans, Specifications and reports are adequate to the best of the Bidder's knowledge and that the Work can be performed in strict accordance with the terms of the Contract Documents.

The Bidder declares by the submission of a 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 a sham; that the Bidder has not directly or indirectly induced or solicited any other Bidder to put in a false or sham Bid, and has not directly or indirectly colluded or agreed with any Bidder or anyone else to put in a sham Bid or to refrain from bidding; that the Bidder has not directly or indirectly sought by agreement, communication, or conference with anyone to fix the Bid price or the Bid price of any other Bidder, or to fix any overhead, profit, or cost element of such Bid price or that of any other Bidder, or to secure any advantage against the City, anyone interested in the Bid as principal, or those named within the Bid; that all statements contained in the Bid are true; that the Bidder has not directly or indirectly submitted a Bid price or any breakdown thereof or the contents thereof, or divulged information or data relative thereto, to any other person, partnership, corporation or association, except to person or persons as have a direct financial interest in the Bidder's general business.

Bid prices shall include everything necessary for the completion of the Work and fulfillment of the Contract, including but not limited to furnishing all materials, equipment, tools, excavation sheeting, bracing and supports, plant, labor and services, except as may be provided otherwise in the Contract. Bid prices shall include all Federal, State, and local taxes, and all other fees and costs not expressly paid for by the City as stated in the Special Provisions.

The Bid shall be submitted in a sealed envelope as directed in the Notice to Contractors. The Bidder shall plainly mark the exterior of the envelope in which the Bid is submitted to indicate that it contains a Bid for the project for which the Bid is submitted, and the date of the Bid opening therefor. Bids submitted in envelopes that are not properly marked will be rejected.

Bidders shall bear full responsibility for delivering Bids to the location for receipt of Bids by the time and date designated for receipt of Bids. No telephones, fax machines or copy machines will be provided by the City.

Section 2.03. Examination of Plans, Specifications and Site of Work.

The Bidder shall examine carefully the site of the proposed Work and the Plans, Specifications and Bid Documents, and shall be satisfied as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. The submission of a Bid shall be conclusive evidence that the Bidder is satisfied through the Bidder's own investigation as to the conditions to be encountered; the character, quality, quantity and scope of work to be performed; and the materials and equipment to be furnished. If material discrepancies or apparent material errors are found in the Plans and Specifications prior to the date of bid opening, an Addendum may be issued (see Section 2-9, "Addenda", in this Section of these Specifications). Otherwise, in figuring the Work, Bidders shall consider that any discrepancies or conflict between Plans and Specifications will be governed by Article 4, "Scope and Intent of Contract Documents".

Section 2.04. Subsurface Conditions.

Where investigations of subsurface conditions have been made by the City with respect to subsurface conditions, utilities, foundation, or other structural designs, and that information is shown in the Plans, it represents only a statement by the City as to the character of materials which have actually been encountered by the City's investigation. This information is only included for the convenience of Bidders.

Investigations of subsurface conditions are made for the purpose of design only. The City assumes no responsibility with respect to the sufficiency or accuracy of borings or of the log of test borings or other preliminary investigations or of the interpretation thereof. There is no guaranty, either expressed or implied, that the conditions indicated are representative of those existing throughout the Work, or any part of it, or that unanticipated conditions may not occur. When a log of test borings is included in the Plans, it is expressly understood and agreed that said log of test borings does not constitute a part of the Contract. The log of test borings represents only an opinion of the City as to the character of the materials to be encountered, and is included in the Plans only for the convenience of the Bidders. Making information available to Bidders is not to be construed in any way as a waiver of the provisions of the first paragraph of this Section, and Bidders must satisfy themselves through their own investigations as to conditions to be encountered.

Section 2.05. Contractors/Subcontractors Required to be Licensed.

The Bidder shall be licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code to do the type of work contemplated in the project, and shall be skilled and regularly engaged in the general class or type of work called for under the contract. The specific type of license required will be indicated in the Notice to Contractors. Unless specified otherwise in the Special Provisions, the Bidder shall indicate the license number and class in the space provided for that purpose on the bid form.



All Subcontractors engaged to perform portions of the Work shall be licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code to do the type of work for which they are subcontracted, and shall be skilled and regularly engaged in the general class or type of work called for under their subcontracts.

Attention is also directed to the provisions of Public Contract Code section 20103.5, which addresses Contractor licensing requirements. The City may not award the Contract if it cannot be verified that the low Bidder is an appropriately licensed Contractor at the time of Contract award.

Section 2.06. Contractors/Subcontractors DIR Registration Requirement

Contractors and subcontractors on all public works projects are required to register with the Department of Industrial Relations (DIR) in accordance with Section 1725.5 of the Labor Code. Beginning March 1, 2015, only bids from contractors and subcontractors that are listed on the DIR website as registered will be accepted. All contracts awarded on or after April 1, 2015 are required to use only registered contractors and subcontractors. The DIR will keep an up to date listing of registered contractors at:

<https://efiling.dir.ca.gov/PWCR/Search.action>

Inadvertent listing of an unregistered subcontractor will not necessarily invalidate a bid. Unregistered contractors or subcontractors may be replaced with registered ones. A contract with an unregistered contractor or subcontractor is subject to cancellation, but is not void as to past work. Contractors and subcontractors must register and pay the applicable fee; this may be done online at the DIR website:

<https://efiling.dir.ca.gov/PWCR/ActionServlet?action=displayPWCRRegistrationForm>

Section 2.07. Competency of Bidders.

It is the intention of the City to award a Contract only to a Bidder who furnishes satisfactory evidence that the Bidder has the requisite experience and ability, and has sufficient capital, facilities, and plant to enable the Contractor to prosecute the Work successfully and promptly, and to complete the Work within the time stated in the Contract. If required by the Special Provisions, a statement of experience and business standing, together with that of particular Subcontractors that were designated in the Bid, shall be submitted on a City-provided form by the three (3) apparent low Bidders within seven (7) Calendar Days after the opening of Bids. Bidders in contention for contract awards may be asked to attend a post-bid interview. To determine the experience of a Bidder, the City will consider any relevant evidence that the Bidder, and/or its personnel, has satisfactorily performed on other contracts of similar nature and magnitude or difficulty.

Section 2.08. Joint Venture Bids.

If two or more prospective Bidders desire to bid jointly as a joint venture on a single project, the joint venture Bid must be accompanied by a notarized copy of a valid license issued to the joint venture by the Contractor's State License Board. If a copy of the joint venture license is not filed with the Bid, the Bid will be rejected.

Section 2.09. Subcontractors.

In accordance with the Subletting and Subcontracting Fair Practices Act of the Public Contract Code, section 4100 et seq. (the "Act"), each Bidder shall list in the bid form:

- A. The name and the location of the place of business of each Subcontractor whom the Bidder proposes to perform work or labor or render service to the prime Contractor in or about the construction of the Work, or a Subcontractor licensed by the State of California who, under subcontract to the prime Contractor, is proposed by the Bidder to specially fabricate and install a portion of the Work according to detailed drawings contained in the Contract, in an amount in excess of one-half of one percent (0.5%) of the total bid, including additive Alternates, if any, or, in the case of a Bid for the construction of streets or highways, including bridges, in excess of one-half of one percent (0.5%) of the Bidder's total bid, including additive Alternates, or ten thousand dollars (\$10,000), whichever is greater.
- B. The portion of the Work that will be done by each Subcontractor. The Bidder shall list only one Subcontractor for each portion as is defined by the Bidder in the Bid. If a Bidder fails to specify a Subcontractor for any portion of the Work to be performed under the Contract (or specifies more than one Subcontractor for the same work) as required in Section 2.08(A) above, the Bidder agrees that the Bidder is fully qualified to perform that portion itself and that the Bidder shall perform that portion of the Work.

If after the award of the Contract, the Contractor subcontracts any portion of the Work, except as provided in Section 4107 or 4109 of the Act, the Contractor shall be subject to the penalties specified in Section 4111 of the Act.

The apparent low Bidder shall submit the license numbers of all Subcontractors to the City within ten (10) Calendar Days, not counting Saturdays, Sundays, and holidays, of Bid opening. If the low Bidder is not the apparent low Bidder, the low Bidder shall submit the license numbers of all Subcontractors to the City within ten (10) Calendar Days, not counting Saturdays, Sundays, and holidays, of the date notified.

#### Section 2.10. Addenda.

The correction of any material discrepancies in, or material additions to/omissions from, the Plans, Specifications, or other Contract, or any interpretation thereof, during the bidding period will be made only by an Addendum issued by the City. A copy of each Addendum issued by the City will be mailed or delivered to each planholder listed on the City planholder list and is a part of the Contract. Any interpretation or explanation not included in the Addenda will not be considered binding. Bids must include acknowledgment of all Addenda issued prior to the bid date.

#### Section 2.11. Assignment of Antitrust Actions.

The Bidder is required to comply with Public Contract Code section 7103.5(b), which addresses assignment of antitrust actions.

#### Section 2.12. Bid Guarantee.

The Bid shall be accompanied by a bid guarantee in the form of a bidder's bond, cash, a certified check or a cashier's check in an amount not less than ten percent (10%) of the bid amount, including additive Alternates, if any. A bid bond shall be executed in favor of the City by a surety company authorized to do business in California, and the attorney-in-fact who executes the bond on behalf of the surety shall attach to the bond a certified, current copy of its Power of Attorney. A certified or cashier's check must be made payable to the City. The bid

guarantee shall pledge that the Bidder will enter into a contract with the City in accordance with the terms stated in the bid form and Agreement for Construction and will furnish required performance and payment bonds and insurance certificates. The City is authorized to forfeit the bid guarantee as necessary to reimburse the City for costs incurred for failure of the successful Bidder to enter into the contract and/or furnish the required performance and/or payment bond and/or insurance certificates. The amount of the bid guarantee shall not be deemed to constitute a penalty or liquidated damages. The City is not precluded by a bid guarantee from recovering from the defaulting Bidder damages in excess of the amount of said bid guarantee incurred as a result of the failure of the successful Bidder to enter into the contract with the City for the Work or the failure of the successful Bidder to provide the required bonds and/or insurance certificates. Bid guarantees for the unsuccessful bidders will be released upon contract execution by the bidder awarded the contract or 60 days after the bid opening, whichever is earlier.

Section 2.13. Modification or Withdrawal of Bid.

A Bid may be modified or withdrawn at any time prior to the hour fixed in the Notice to Contractors for the submission of Bids by a written request of the Bidder filed with the City at the location where the Bid was submitted. Modifications and/or withdrawals shall be in writing. Telephone or fax modifications will not be accepted. The withdrawal of a Bid will not prejudice the right of a Bidder to file a new Bid within the time prescribed.

Section 2.14. Public Opening of Bids.

Bids will be opened and read publicly at the time and place indicated in the Notice to Contractors or in a subsequent Addendum. Bidders or their authorized representatives and other interested parties are invited to be present.

Section 2.15. Rejection of Bids.

The City reserves the right to reject any and all Bids. The City reserves the right to waive irregularities in a Bid and to make an award in the best interest of the City. Bids containing omissions, erasures, alterations, conditions, or additions not called for may be rejected.

Section 2.16. Disqualification of Bidders.

More than one Bid from any individual, firm, partnership, corporation or association, under the same or different names, will not be considered. Reasonable ground for believing that any Bidder is interested in more than one Bid for the Work will cause rejection of all Bids in which such Bidder is interested. If there is reason to believe that collusion exists among Bidders, none of the participants of such collusion will be considered.

Any Bid in which the prices obviously are unbalanced may be rejected.

Section 2.17. Relief of Bidders.

Attention is directed to Public Contract Code sections 5100 through 5107, concerning relief of Bidders and in particular to the requirement therein that if the Bidder claims a material mistake was made in its Bid, the Bidder shall give the City written notice within five (5) days after the opening of the Bids (excluding Saturdays, Sundays, or City holidays) of the alleged mistake, explaining in the notice in detail how the mistake occurred.

Section 2.18. Bid Protests

As set forth in the Resolution of Disputes Regarding the Bidding Process form to be included with the bids, any Bidder may file a protest against the award of the Contract to any other

Bidder. All Bidders shall be provided with notice of the date and time of the City Council meeting at which the award of the Contract for the Project shall be considered. All Bidders will be provided with an opportunity to bring to the City Council's attention disputes and/or protests regarding the bidding process. No Bidder may bring any action or proceeding challenging the bidding process unless the alleged grounds for the dispute and/or protest are presented in a timely manner and consistent with this section.. Any Bidder complying with these procedures may bring an action within sixty (60) Calendar Days from the action of the City Council, in accordance with Section 860 et seq. of the California Code of Civil Procedure, to determine the validity of the City Council's action on the award of the Contract. See form for Resolution of Disputes Regarding the Bidding Process governing the procedures for disputes and/or protests regarding the bidding process.

- A. Any bid protest must be in writing and received by the City Clerk at 50 Natoma Street, Folsom, CA 95630 before 5:00 p.m. no later than five (5) working days following bid opening (the "Bid Protest Deadline") and must comply with the following requirements; however, if the date set for the City Council bid award is less than five (5) working days from the bid opening, the bid protest must be submitted to the City Clerk at least 24 hours prior to the time set for the City Council meeting:
- B. Only a bidder who has actually submitted a Bid Proposal is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit bid protests. A bidder may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest.
- C. The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address, email address, and telephone number of the person representing the protesting bidder if different from the protesting bidder.
- D. A copy of the protest and all supporting documents must also be transmitted by fax or by email, by or before the Bid Protest Deadline, to the protested bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest
- E. The protested bidder may submit a written response to the protest, provided the response is received by Owner before 5:00p.m., within two (2) working days after the Bid Protest Deadline or after receipt of the bid protest, whichever is sooner (the "Response Deadline"). If there are less than two working days remaining prior to the City Council meeting to award the bid, the response must be submitted to the City Clerk prior to the start of the City Council meeting. The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person representing the protested bidder if different from the protested bidder.
- F. A copy of the response and all supporting documents must also be transmitted by fax or by e-mail, by or before the Bid Protest Deadline, to the protesting bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

- G. The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. The bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.
- H. Owner reserves the right to award the Contract to the bidder it has determined to be the responsible bidder submitting the lowest responsive bid, and to issue a notice to proceed with the work notwithstanding any pending or continuing challenge to its determination.

### ARTICLE 3. AWARD AND EXECUTION OF CONTRACT; BONDS AND INSURANCE

#### Section 3.01. Consideration of Bids.

After the Bids have been opened and read, they will be checked for accuracy and compliance with the Notice to Contractors, these General Provisions and the Special Provisions.

In the event that the product of a unit price and an Estimated Quantity does not equal the extended amount quoted, the unit price shall govern, and the correct product of the unit price and the Estimated Quantity shall be deemed to be the amount bid. If the sum of two or more items in a bidding schedule, or the sum of two or more bidding schedules does not equal the total amounts quoted, the individual items or schedule amounts shall govern, and the correct total shall be deemed to be the amount bid. If the Bid is missing the unit price, then it may be deemed included and the Bid may be rejected. When a price is quoted in both words and figures, the words shall prevail in case of a discrepancy.

The City reserves the right to reject any and all proposals and to waive any irregularity in a Bid.

#### Section 3.02. Award of the Contract.

Award of the Contract will be to the lowest, responsive, responsible Bidder whose Bid complies with the specified requirements. The award, if made, will be made within 45 days after the opening of Bids, unless otherwise specified. If the lowest responsive, responsible Bidder refuses or fails to execute the Contract or to provide required bonds and/or insurance certificates, the City may award the Contract to the second lowest responsive, responsible Bidder. The specified period of time within which the award may be made may be subject to extension for further periods as agreed upon in writing by the City and the Bidder.

The City reserves the right to award the Contract based on any combination of base bid and Alternates as determined by the City. This process is conducted by the City in a "blind selection" format, i.e., without knowledge of the identity of any of the Bidders before ranking of all Bidders from lowest to highest has been determined. All awards will be made in the City's best interest.

The City will comply with state law requirements for submission of a PWC-100 form (contract award notice) to DIR for all public works projects.

#### Section 3.03. Performance and Payment Bonds.

The format of the Performance Bond and Payment Bond forms shall be those contained in these Specifications. As part of the execution of the Contract, the successful Bidder shall furnish the following corporate surety bonds to the benefit of the City. Bonds shall be executed by a surety company authorized to do business in the State of California. When the amount to be paid to the Contractor is based upon units of work to be performed or items to be provided, the term Contract Sum as used below for the purpose of posting Performance and Payment Bonds shall be computed on the basis of the unit price bid multiplied by the Estimated Quantities of work to be performed.

##### A. Performance Bond.

The Performance Bond, to guarantee the performance of all covenants and stipulations of the Contract, shall be on the form provided by the City and shall be in a sum not less than one hundred percent (100%) of the original Contract Sum as set forth in the Contract. The bond shall contain a provision that the surety thereon waives the

provisions of California Civil Code sections 2819 and 2845.

**B. Payment Bond.**

The Payment Bond, to guarantee the payment of wages and of bills contracted for materials, supplies, or equipment used in the performance of the Contract, shall be on the form provided by the City and shall be in a sum not less than one hundred percent (100%) of the original Contract Sum as set forth in the Contract. The bond shall be in accordance with the provisions of California Civil Code section 8152, 8154, 9550, 9552, 9554, 9558, 9560, and 9564, and any acts mandatory thereof, and shall, by its terms, inure to the benefit of all persons, companies, or corporations entitled to file claims under California Civil Code section 9100 and California Unemployment Insurance Code section 13020. Said bond shall also contain a provision that the surety waives the provisions of California Code of Civil Procedure section 2819 and 2845.

**Section 3.04. Additional Bonding Requirements.**

All bonds submitted shall include the following:

- A. Full name and address of the Contractor, Surety, and the City;
- B. Contract Date;
- C. Exact Contract Sum;
- D. Project name and address;
- E. Signature of the Contractor;
- F. Corporate seal if applicable;
- G. Signature of authorized Surety representative;
- H. Notarization of the Contractor and Surety;
- I. Power of Attorney; and
- J. Local contact for surety, with name, phone number, and address to which legal notices may be sent.

**Section 3.05. Bond Costs in Bids.**

All costs for applicable Bid Bonds, Performance Bonds, Payment Bonds, and any other bonds specially required by the Contract shall be included in the Bid.

**Section 3.06. Notification of Surety Companies.**

The surety companies shall be familiar with all the provisions and conditions of the Contract. It is understood and agreed that the surety companies waive notice of change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or to the specifications accompanying the same, or any other act or acts by the City or the City's authorized agents under the terms of the Contract; and failure to so notify the surety companies of changes shall in no way relieve the surety or sureties of their obligations under the Contract.

**Section 3.07. Return of Bid Guarantees.**

After Bids have been received and reviewed by the City, bid guarantees will be returned to the respective Bidders except those submitted by the three lowest responsive, responsible Bidders.

Bid guarantees for Bids not to be further considered in executing the Contract will be returned within ten (10) days after the award of the Contract. The Bid Guarantees of the three lowest responsive, responsible Bidders will be returned within ten (10) Calendar Days after the successful Bidder has filed satisfactory bonds and proof of insurance as specified and the Bidder and the City have executed the Contract.



If all Bids are rejected and no award is made, all bid guarantees will be returned within ten (10) days of the decision of the City not to award the Contract.

Section 3.08. Execution of the Contract.

The Contract shall be executed by the successful Bidder in triplicate. All three copies of the Contract, together with the Performance Bond, Payment Bond, certificates of insurance and insurance endorsements shall be returned to the City within ten (10) Calendar Days of the Bidder's receipt of the documents. When required by the Special Provisions, Affirmative Action Certifications will also be provided. Insurance certificates shall be signed by a person authorized by the insurer to bind coverage on its behalf and shall be accompanied by copies of all endorsements required by these Specifications. When requested by the City, the successful bidder shall furnish complete, certified copies of all required insurance policies, including endorsements specifically required by these Specifications. After execution by the City, a full set of documents will be returned to the Contractor.

Section 3.09. Failure to Execute Contract.

If the Bidder to whom the Contract is awarded fails to execute the Contract and file acceptable bonds, insurance certificates and insurance endorsements as provided herein within ten (10) Calendar Days from the time the Contract forms are received by the Bidder, the award may be annulled and the Bidder's Bid Guarantee forfeited to the City. At the City's discretion, the Contract may then be awarded to the next lowest responsive, responsible Bidder.

If the City awards the Contract to the second lowest responsive, responsible Bidder, the amount of the lowest responsive, responsible Bidder's bid guarantee shall be applied by the City to the difference between the lowest Bid and the Bid of the second lowest responsive, responsible Bidder, and the surplus, if any, will be returned to the lowest responsive, responsible Bidder if a check or cash is used, or credited to the surety on the Bidder's Bond if a bond is used.

On refusal or failure of the second lowest responsive, responsible Bidder to execute the Contract, the City in its discretion may award it to the third lowest responsive, responsible Bidder. If the City awards the Contract to the third lowest responsive, responsible Bidder, in addition to application of the lowest Bidder's bid guarantee as aforesaid, the amount of the second lowest responsive, responsible Bidder's bid guarantee shall be applied by the City to the difference between the Bid of the second lowest responsive, responsible Bidder and the Bid of the third lowest responsive, responsible Bidder, and the surplus, if any, shall be returned to the second lowest responsive, responsible Bidder if a check or cash is used, or credited to the surety on the second lowest Bidder's Bid Bond if a bond is used.

Section 3.10. Insurance

The Contractor shall procure, maintain and keep in force at all times during the term of the Contract, at its sole cost and expense, the following insurance. Failure by the Contractor to maintain all required insurance during the entire Contract Time shall constitute a default entitling the City to all rights and remedies that exist in the Contract Documents and/or by law.

A. General Liability.

General Liability insurance including, but not limited to, protection for claims of bodily injury and property damage liability; personal and advertising injury liability; products and completed operations liability; premises, operations and mobile equipment liability; and explosion, collapse and underground property damages. Coverage shall be at least as



broad as "Insurance Services Office Commercial General Liability Coverage Form CG 0001" (occurrence"). Claims made coverage is not acceptable. The limits of liability shall be not less than:

Each Occurrence One Million Dollars (\$1,000,000)  
Personal & Advertising Injury One Million Dollars (\$1,000,000)  
Products and Completed Two Million Dollars (\$2,000,000)  
Operations Aggregate  
General Aggregate Two Million Dollars (\$2,000,000)  
Fire Damage One Hundred Thousand Dollars (\$100,000)

The insurance shall cover all operations of the Contractor and its Subcontractors, including, but not limited to, contractual liability insuring the obligations assumed by the Contractor and its Subcontractors under the Contract Documents, independent contractor's contingent coverage, broad form property damage liability endorsement, and personal injury liability endorsement.

The insurance shall provide coverage for claims arising out of subsidence.

The Products and Completed Operations coverage shall be maintained for at least two years after completion of the Contract.

**B. Automobile Liability.**

Automobile Liability insurance providing protection against claims of bodily injury and property damage arising out of ownership, operation, maintenance, or use of owned, hired and non-owned automobiles. Coverage shall be at least as broad as "Insurance Services Office Business Auto Coverage Form CA 0001" symbol 1 (any auto). The limits of liability per accident shall be not less than:

Bodily Injury and Property One Million Dollars (\$1,000,000)  
Damage, Combined Single Limit

If General Liability coverage, as required above, is provided by the Commercial General Liability form, the Automobile Liability policy shall include an endorsement providing automobile contractual liability.

**C. Workers' Compensation.**

In accordance with the provisions of Section 3700 of the Labor Code, the Contractor, and each Subcontractor, shall secure the payment of compensation to its employees. The Contractor and each Subcontractor shall provide workers' compensation insurance and occupational disease insurance as required by the State of California (unless the Contractor is a qualified self-insurer with the State of California), and Employer's Liability coverage. The limits of Employers' Liability coverage shall be not less than:

Each Accident One Million Dollars (\$1,000,000)  
Disease Each Employee One Million Dollars (\$1,000,000)  
Disease Each Policy Limit One Million Dollars (\$1,000,000)

The Contractor shall sign and file with the City's Director of Finance the following certification prior to commencing performance of the work of the Contract:

"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this Contract."

The Contractor shall require each Subcontractor to file such statement prior to allowing that Subcontractor to commence work.

The Contractor shall furnish a certificate of insurance or a certificate of permission to self-insure under the Workers' Compensation and Employers' Liability Insurance statutes of the State of California. The certificate shall provide that at least thirty (30) days' prior written notice shall be served on City prior to the cancellation or change of such insurance or self-insurance. Said certificate shall also provide that the insurer shall waive all rights of subrogation against the City, its officers, officials, employees, agents or volunteers.

D. Insurance Required in the Special Provisions.

1. Excess or Umbrella Liability. If the Special Provisions require limits of general liability insurance of more than one million dollars (\$1,000,000) per occurrence, the Contractor shall carry excess or umbrella liability insurance providing excess coverage at least as broad as the underlying coverage for general, automobile and employer's liability with a limit equal to the amount stated in the Special Provisions per occurrence and aggregate.
2. Railroad Protective Liability. When stated as a requirement in the Special Provisions, the Contractor shall procure, maintain, and keep in force during the term of the Contract, at the Contractor's sole expense, Railroad Protective Liability insurance with limits of liability as set forth in the Special Provisions.
3. Builder's Risk. When stated as a requirement in the Special Provisions, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract and until the date of transfer of the insurable interest to and acceptance by the City, at the Contractor's sole expense, Builder's Risk insurance with limits of liability equal to one hundred percent (100%) of the replacement cost of the Work.
  - a. Coverage shall be written on a completed value, non-reporting form, on a replacement cost basis, and shall cover the property against all risks of physical loss or damage including:
    - i. land movement and flood
    - ii. loss that ensues from design error, defective materials, or faulty workmanship
    - iii. mechanical breakdown or electrical damage including testing, magnetic disturbance and changes in temperature or humidity.

The property covered shall include the Work, including any materials, equipment, or other items to be incorporated therein while the same are located at the construction site, stored offsite, while in transit or at the place of manufacture. The policy shall contain a provision that both the interests of the City and the Contractor are covered and that any loss shall be payable to

the City and the Contractor as their interests may appear.

When stated as a requirement in the Special Provisions, Builders Risk insurance shall include Delay in Opening coverage with limits of liability, and for the period of time, as set forth in the Special Provisions. Coverage shall include interest and/or principal payments that become due and payable by the City upon completion of construction or other date as set forth in the Special Provisions, debt service, expense, loss of earnings or rental income or other loss incurred by the City, without deduction, due to the failure of the project being completed on schedule.

- b. The maximum deductible for land movement and flood allowable under this policy shall be five percent (5%) of replacement value per unit, including foundations, at the time loss or five hundred thousand dollars (\$500,000), whichever is less, per occurrence and in the aggregate. Unit shall be defined in the policy as (1) each separate building or structure; (2) contents of each separate building or structure; or (3) property in each separate yard. The maximum deductible for all other perils allowable under this policy shall be one hundred thousand dollars (\$100,000). All deductibles shall be borne solely by the Contractor, and the City shall not be responsible to pay any deductible, in whole or in part.
  - c. The Contractor waives all rights against the City and the City's officers, officials, employees and agents for loss or damage to the extent reimbursed by Builders' Risk insurance or any other property or equipment insurance applicable to the Work, except such rights as it may have to the proceeds of such insurance. If the policies of insurance referred to in this section require an endorsement or consent of the insurance company to provide for continued coverage where there is a waiver of subrogation, the owners of such policies will cause them to be so endorsed to obtain such consent.
  - d. If not covered by Builders' Risk insurance or any other property or equipment insurance required by this Contract, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, property insurance for portions of the Contractor's work and/or equipment to be incorporated therein stored offsite or in transit.
4. Environmental Liability Insurance. When stated as a requirement in the Special Provisions, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, Environmental Liability insurance which includes coverage for sudden and accidental pollution arising out of the handling of hazardous materials or hazardous wastes, and coverage for liability arising out of the handling of asbestos. Coverage for asbestos shall contain a provision limiting coverage to a specific length of time (i.e., "sunset clause"). If coverage for Environmental Liability insurance is written on a claims-made form, the following provisions apply:

- a. The "Retro Date" must be shown, and must be on or before the date of the Contract or the beginning of the Work.
- b. Insurance must be maintained and evidence of insurance must be provided for at least two (2) years after completion of the Contract.
- c. If coverage is cancelled or non-renewed, and not replaced with another claims-made policy form with a "Retro Date" prior to the Contract effective date, the Contractor must purchase "extended reporting" coverage for a minimum of two (2) years after completion of the Contract.

E. Subcontractor's Insurance.

The Contractor shall not allow any Subcontractor to commence work on its subcontract until the Subcontractor has provided the insurance specified above. The Contractor shall require each of its Subcontractors to procure and to maintain, during the life of the subcontract, bodily and personal injury liability and property damage insurance, and workers' compensation insurance, of the type and in the same amount as specified herein.

It shall be the responsibility of the Contractor to ensure that all Subcontractors comply with this provision, and to verify their compliance when requested by the City.

If requested by the City, the Contractor shall deliver certificates of insurance or copies of the insurance policies and endorsements of all Subcontractors; provided, however, that this authority shall not relieve the Contractor of its obligation to ascertain the existence of such insurance.

F. Effective Date of Policies.

The insurance required by these General Provisions and by the Special Provisions shall be maintained by the Contractor in full force and effect at all times during prosecution of the Work and until two (2) years after the final completion and acceptance thereof by City.

G. Other Provisions

1. The Contractor's General Liability, Automobile Liability, and any Excess or Umbrella Liability, shall contain the following provisions:
  - a. The City, its officers, officials, employees and agents shall be covered as additional insureds as respects liability arising out of the activities performed by or on behalf of the Contractor, products and completed operations of the Contractor, premises owned, occupied, or used by the Contractor, or automobiles owned, leased, hired, or borrowed by the Contractor. The policy shall contain no special limitations on the scope of coverage afforded to the City, its officers, officials, employees and agents.
  - b. For any claims related to this Contract, the Contractor's insurance coverage shall be primary insurance as respects the City, its officers, officials, employees or agents. Any insurance or self-insurance maintained by the City, its officers, officials, employees or agents shall be excess of the Contractor's insurance and shall not contribute with it.
  - c. Any failure to comply with reporting or other provisions of the policies on the

part of the Contractor, including breaches of warranties, shall not affect coverage provided to the City, its officers, officials, employees, and/or agents.

2. The Contractor's General Liability and any Excess or Umbrella Liability Insurance policies shall contain an endorsement stating that any aggregate limits shall apply separately to the Work.
3. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
4. Each insurance policy shall state by separate endorsement that the insurer agrees to waive all rights of subrogation against the City, its officers, officials, employees or agents.
5. Each insurance policy shall state that coverage shall not be suspended, voided, cancelled by the Contractor or the City, reduced in scope of coverage or in limits, non-renewed, or materially changed unless the insurer(s) provide thirty (30) days written notice by certified mail to the City prior to such change. Ten (10) days prior written notice by certified mail shall be given to the City in the event of cancellation due to nonpayment of premium.
6. All of the Contractor's insurance coverage, except as noted below, shall be placed with insurance companies with a current A.M. Best rating of at least A-:VII.

Exceptions:

- a. Underwriters at Lloyd's of London, which are not rated by A.M. Best.
  - b. Workers' Compensation that is provided through a State Compensation Insurance Fund or a qualified self-insurer for Workers' Compensation under California law.
  - c. Environmental Liability insurance shall be placed with insurance companies with a current A.M. Best rating of at least B+:VII.
7. Any Contractor that self-insures its general and/or automobile liability losses must have a minimum net worth of at least ten million dollars (\$10,000,000).
  8. The City, at its discretion, may require new types of insurance coverage or increase the limits of insurance coverage required hereunder at any time during the term of the Contract by giving thirty (30) days written notice to the Contractor. Contractor shall immediately procure such insurance or increase the limits of coverage and provide certificates of insurance, including copies of all required endorsements, to the City within thirty (30) days of receipt of the City's request.
  9. The required insurance coverage shall be subject to the approval of the City, but any acceptance of insurance certificates by the City shall in no way limit or relieve the Contractor of its duties and responsibilities in this Contract.

10. If the Contractor fails to procure or maintain insurance as required by this Section and any Special Provisions, or fails to furnish the City with proof of such insurance, the City, at its discretion and in addition to its other remedies under the Contract and at law for the Contractor's default, may procure any or all such insurance. Premiums for such insurance procured by the City shall be deducted and retained from any sums due the Contractor under the Contract.

Failure of the City to obtain such insurance shall in no way relieve the Contractor from any of the Contractor's responsibilities under the Contract. Any failure of the Contractor to maintain any item of the required insurance is sufficient cause for termination of the Contract.

11. The making of progress payments to the Contractor shall not be construed as relieving the Contractor of responsibility for loss or damage, or destruction occurring prior to final acceptance by the City.
12. The City is authorized to execute amendments and waivers, with or without conditions, to the insurance requirements of the Contract. The City will provide such amendments or waivers in writing to the Contractor.
13. The failure of the City to enforce in a timely manner any of the provisions of this Section 3.10 shall not act as a waiver to enforcement of any of these provisions at any time during the term of the Contract.

H. Notification of Accident or Occurrence.

The Contractor shall report by telephone to the City within twenty-four (24) hours and also report in writing to the City within fifteen (15) Calendar Days after the Contractor or any Subcontractors or agents have knowledge of any accident or occurrence involving death of or injury to any person or persons, or damage in excess of ten thousand dollars (\$10,000) to the Work, property of the City or others, arising out of any work done by or on behalf of the Contractor as part of the Contract. Such report shall contain:

1. the date and time of the occurrence;
2. the names and addresses of all persons involved; and
3. a description of the accident or occurrence and the nature and extent of injury or damage.

## ARTICLE 4. SCOPE OF WORK AND INTENT OF CONTRACT DOCUMENTS

### Section 4.01. The Contract.

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the City and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Change Order. Nothing contained in the Contract Documents shall create any contractual relationship between the City or any of its officers, officials, employees or agents and any Subcontractor or sub-subcontractor, or between the Owner's Representative or the Architect or Consulting Engineer and the Contractor.

### Section 4.02. Intent of Contract Documents.

The Work shall be performed and completed according to the Contract Documents. It is the overriding intent of the Contract Documents that the work performed shall result in a complete and operable system in satisfactory working condition with respect to the functional purposes of the installation, and which complies in all respects with the Contract Documents. No extra compensation will be allowed for anything omitted but fairly implied to be included in the Contract Documents. The prices paid for the various items in the Bid shall include full compensation, including all markups and profit, for furnishing all labor, materials, tools, equipment and incidentals, and doing all items necessary to complete the Work in a good and workmanlike manner as provided by the Contract Documents.

If the Contract does not specifically allow the Contractor a choice of quality or cost of items to be furnished, but could be interpreted to permit such a choice, the Contractor shall furnish the highest quality under current industry standards, regardless of the cost of the item.

When portions of the Work are described in general terms, but not in complete detail, it is understood that the Contractor will employ only the best general practice and incorporate only the best quality materials and workmanship in the Work.

### Section 4.03. General Liability of Contractor.

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, light, heat, utilities, transportation and other facilities and services necessary for the execution and completion of the Work in accordance with the Contract Documents and any applicable code or statute, whether or not specifically described herein, as long as same is reasonably inferable therefrom as being necessary to produce the intended results, whether temporary or permanent, and whether or not incorporated or to be incorporated in the Work. The mention of any specific duty or liability of Contractor and, any reference to any specific duty or liability shall be construed to be for the purpose of explanation.

### Section 4.04. Complementary Feature of Various Parts of Contract Documents.

The Contract Documents, including the Specifications and Drawings, are complementary and explanatory of each other, and what is called for by any one shall be as binding as if called for by all. In case of conflict, large scale (detail) drawings shall govern over small-scale drawings, the Specifications shall govern over the Contract Drawings except as noted below, special provisions shall govern over both the Contract Drawings and the Standard Specifications, and subsequent addenda, interpretations, or approved change orders shall govern over the original documents, unless a different order of precedence is noted elsewhere in conjunction with a specific portion of the documents.



In case of conflict between the Drawings and Specifications, the Drawings shall govern in matters of quantity and size, the Specifications in matters of quality. In case of conflict within the Drawings involving quantities or within the Specifications involving quality, the greater quantity and the higher quality shall be provided.

Where on any Drawing a portion of the Work is drawn out and the remainder is indicated in outline, the drawn-out parts shall apply to all other like portions of the Work. Where ornament or other detail is indicated as starting, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to other similar parts in the Work, unless otherwise indicated.

Any material specified by reference to the number, symbol, or title of a specified standard such as a Commercial Standard, a Federal Specification, a trade association standard, or other similar standards, shall comply with the requirements in the latest approved revision thereof and any amendments or supplements thereto in effect on the date of Notice to Bidders, except as limited to type, class, or grade, or modified in such reference. The standards referred to, except as modified in the Specifications, shall have full force and effect as though printed in these Specifications.

Any work for which there are no provisions in these Specifications, the Special or Technical Provisions, or on the Contract Drawings, shall be performed in accordance with the provisions of the State Specifications

Section 4.05. Diagrammatic Drawings.

Drawings showing the locations of equipment, wiring, piping, etc., unless dimensioned, are diagrammatic, and conditions will not always permit their installation in the exact location shown. In such event, the Contractor shall submit an RFI and obtain a response before proceeding with the work in question. Unless there is a material increase in the Contractor's scope of work, installation as specified in the response to the RFI shall be without any additional compensation to the Contractor and without any increase in the Contract Time. Any work done after discovery of the issue, until authorization to proceed based on the response to the RFI, will be done at the Contractor's risk.

Section 4.06. Conformance with Codes and Standards.

The Works shall be in full compliance with the latest adopted editions of the following applicable standards and regulations:

- the State Fire Marshal
- the UBC
- Title 8
- Title 24
- the NEC
- the UPC
- the Clean Water Act
- Storm Water Pollution Prevention Plan and standards
- all other codes, laws or regulations applicable to the Work or the Contract.

Nothing in the Contract is to be construed to permit work not conforming to these requirements. When the work detailed in the Plans and Specifications differs from governing codes, the



Contractor shall complete the Work in accordance with the higher standard. If the higher standard so required is more expensive than the work detailed in the plans and specifications, the Contractor will be compensated for its additional costs by change order as provided in these General Provisions.

Section 4.07. Interpretation and Additional Instructions.

Should the Contractor discover any conflicts, omissions, or errors in the Contract Documents, or have any question concerning interpretation or clarification of the Contract Documents, or if it appears that the Work to be done or any matters relative thereto are not sufficiently detailed or explained in the Contract Documents, then before proceeding with the work affected, the Contractor shall within 48 hours notify the Owner's Representative in writing by submitting an RFI requesting interpretation, clarification, or additional detailed instructions and/or drawings concerning the work. All such questions shall be resolved and instructions to the Contractor issued by the Architect or Consulting Engineer.

The City, through the Architect or Consulting Engineer, will normally respond to the RFI within fifteen (15) Working Days. The response will be in writing, and that response shall control. The Contractor shall indicate a priority for responses to RFI's if more than five (5) RFI's are pending at the same time.

Should the Contractor proceed with the work affected before receipt of instructions from the Architect or Consulting Engineer, and, in the case of a change to the Work, before receipt of authorization to proceed, the Contractor shall remove and replace or adjust any work which is not in accordance therewith, and the Contractor shall be responsible for any resultant damage, defect, or added cost without an extension of the Contract Time.

Section 4.08. Plans and Specifications Furnished.

The City will provide, at no cost to the Contractor, five (5) copies of the Contract Drawings and Specifications (except City Standard Construction Specifications, State Specifications and State Plans). The Contractor may purchase additional copies of the Contract Drawings and Specifications, as well as the City Standard Construction Specifications, at cost.

The Contractor shall retain an approved set of Contract Documents on the job at all times during the progress of the Work. This set shall be used by the Contractor as the Record Documents as described in Section 4.15 of these General Provisions.

Section 4.09. Field Instructions/Written Directives and Drawings/Supplemental Drawings.

In addition to the Drawings incorporated in the Contract Documents, the City may issue Field Instructions, Written Directives, Supplemental Drawings or instructions from time to time as may be necessary to make clear or to define in greater detail the intent of the Contract Drawings and Specifications. In furnishing Field Instructions, Written Directives, additional drawings or instructions, the City shall have the authority to make minor changes in the Work, not involving any extra cost, and not inconsistent with the overall design of the Project. If extra cost is known to be involved, these instructions will be accompanied by an RFP. These supplemental Field Instructions, Written Directives and/or Supplemental Drawings or instructions shall become a part of the Contract Documents, and the Contractor shall make its work conform to them forthwith or within such time as may be specified therein.

Section 4.10. Notification of Disagreement Regarding Scope of Work.

If agreement cannot be reached as to cost, and the Contractor does not agree that work due to an interpretation or supplemental drawing or instruction is within the scope of the Contract Documents, the Contractor shall, within seven (7) Calendar Days after receipt of the interpretation or instruction, submit a proposed change order to the Owner's Representative specifying in detail in what particulars the contract requirements were exceeded and the change in cost resulting there from. The Owner's Representative shall then determine whether a Change Order shall be issued in accordance with these General Provisions. If a CCD is issued, the Contractor shall perform the work without delay.

Section 4.11. Deleted Items.

The City may delete from the Work any items of work. The Contractor will be paid for all work done toward the completion of the item prior to such omission, as provided in Article 9, "Changes and Claims", of these General Provisions, but in no event will the amount paid exceed the Bid or Schedule of Values amount less the value of the deleted work.

The Contractor shall make no claim, nor receive any compensation for profits, for loss of profits, for damages, or for any extra payment whatsoever because of any deleted items of work.

Section 4.12. Extra Work.

Work not covered by the Contract but necessary for the proper completion of the Project will be classed as extra work and shall be performed by the Contractor when directed in writing by the City. Extra work shall be performed in accordance with the Contract and as directed by the City. Extra work must be authorized in writing by the City before the work is started. Payment for extra work will not be made unless such prior written authorization is obtained.

In the event of an emergency or other situation that endangers the Work or endangers public safety, the City will direct the Contractor to perform such extra work as is necessary to protect the Work or the public.

Section 4.13. Ownership and Use of Documents.

All original Drawings and Specifications prepared by or on behalf of the City, including, without limitation, by the Architect or Consulting Engineer, are and shall remain the property of the City.

Section 4.14. Lands and Rights-of-Way.

The City shall provide the lands, rights-of-way and easements upon which the Work is to be done and such other lands as may be designated in the Plans for the use of the Contractor. The Contractor shall confine its operations to within these limits.

The Contractor shall provide at the Contractor's own expense any additional land and access that is required for temporary construction facilities or storage of materials. The Contractor shall obtain all required permissions for use of private property prior to taking possession or use. The permission shall be obtained in writing and a copy forwarded to the City prior to the Contractor taking possession of said property.

Section 4.15. Record/As-Built Documents and Specifications.

The Contractor shall keep and maintain on the Site, one record set of the Drawings and Specifications, which shall be updated weekly to reflect current as-built conditions of the Work as the Work progresses and document changes to the Work shown on the Project Plans and Specifications, including buried or concealed construction and utility features that are revealed during the course of construction. Special attention shall be given to recording of all buried

utilities that differ from locations indicated in the Contract Documents.

Record Documents shall be produced by marking a full size copy of the Project Plans and Specifications as follows:

**Red** – Additions including notes and dimensions.

**Green** – Deletions (by hash marks or appropriate lines through the deletion).

**Graphite (gray)** – General comments and notes used by the Contractor or the City and not required on the as-built.

**Yellow** – Work completed as shown and used by the City in field review of the as-built during the submittal phase.

**Blue** – City verification and notes required to be added by the City in review of the as-built, during submittal phase.

The Contractor's as-built information shall be clear and legible, and at a minimum, the following information shall be inserted and dimensioned on those drawings and specifications: the exact horizontal and vertical location of all installations in their finished condition, including all underground work, including all sprinkler system piping and components; all electrical, plumbing and mechanical installations; all changes in construction, materials and installed equipment; posting of all issued addenda to the bid documents; adequate dimensional data, both horizontal and vertical, to allow location of covered installations; the identification of changes authorized by Change Order, CCD, Field Instruction, Written Directive, Supplemental Drawing or other written instruction and the number of that Change Order, CCD, Field Instruction, Written Directive, Supplemental Drawing or other written instruction. The updated drawings and specifications shall be available for review by the City, Owner's Representative and/or the Inspector.

Written confirmation from the Owner's Representative that the as-builts have been properly updated weekly shall be submitted with each pay application request, and the existence of such properly updated as-builts shall be a condition precedent to payment. Failure to comply with the preparation and submission of as-builts may result in the City withholding the current progress payment.

As a condition to certification of final completion, the Contractor shall provide the original Record Documents, together with a certification by the Contractor that the Record Documents are a true representation of the Work as actually constructed. Timely submission of complete Record Documents shall be a condition precedent to certification of final completion and to final payment. Delays in the submission of complete Record Documents may subject the Contractor to liquidated damages.

## ARTICLE 5. CONTROL OF WORK AND MATERIALS

### Section 5.01. Authority of the City.

The City will decide all questions regarding the quality and acceptability of materials furnished, work performed, and rate of progress of the Work. The City will decide all questions regarding the interpretation and fulfillment of the Contract on the party of the Contractor, and all questions as to the rights of different prime contractors involved with the Work. The City will determine the amount and quality of the Work performed and materials furnished for which payment is to be made under the Contract.

The City will administer its authority through a duly designated representative identified at the pre-construction conference. The Contractor and the City's designated representative (the Owner's Representative) shall make good faith attempts to resolve disputes that arise during the performance of the Work.

Any order given by the City not otherwise required by the Contract to be in writing shall be given or confirmed by the City in writing at the Contractor's request. Such request shall state the specific subject of the decision, order, instruction, or notice and, if it has been given orally, its date, time, place, author and recipient.

Any plan or method suggested to the Contractor by the City, the Architect or Consulting Engineer, or the Owner's Representative, but not specified or required in writing, if adopted or followed in whole or in part by the Contractor, shall be used at the risk and responsibility of the Contractor. The City assumes no responsibility.

### Section 5.02. Supervision Procedures.

The Contractor shall supervise and direct the Work using its best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, and procedures and for coordinating all portions of the Work under the Contract.

The Contractor shall be responsible to the City for the acts and omissions of its employees, Subcontractors and their agents and employees and other persons performing any of the Work.

The Contractor shall not be relieved from its obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Architect, Consulting Engineer or the Owner's Representative in their administration of the Contract or by inspections, tests or approvals (or the lack thereof) required or performed under the Contract Documents by persons other than the Contractor.

### Section 5.03. Personal Attention and Superintendence; Contractor's Agent.

The Contractor shall supervise the work to the end that it shall be faithfully prosecuted. The Contractor shall employ a competent superintendent who is fully empowered to act as agent for the Contractor on the Site. The Contractor shall advise the City in writing of its agent prior to the start of any work. The Contractor shall provide résumés for all of the Contractor's supervisory employees to be assigned to the Project for City review, and the City may reject any supervisory employees not deemed to be qualified at the sole discretion of the City. The Contractor shall be responsible for the faithful observation of all instructions delivered to its authorized agent(s). No additional compensation will be paid by the City for any work performed by the superintendent.

Section 5.04. Skilled Labor.

All non-apprentice labor shall have the skills of a journeyman in the applicable trade. All workmanship shall be of the highest quality and finish in all respects.

Section 5.05. Dismissal of Unsatisfactory Employees.

All employees engaged in the Work will be considered employees of the Contractor.

The Contractor shall at all times enforce strict discipline and good order among all employees and shall not employ on the Work any unfit person or anyone not skilled in the assigned task. The Contractor shall remove, or cause a Subcontractor to remove from the Project, any incompetent employee, or any employee not skilled for the type of work required. If any person employed by the Contractor or any Subcontractor shall fail or refuse to carry out the directions of the City or the provisions of the Contract Documents, or is, in the opinion of the City, incompetent, unfaithful, intemperate, or disorderly, or is acting or working in a manner that compromises the safety of the Work or persons or property involved with the Work, or is otherwise unsatisfactory, the Contractor shall, when requested by the City, remove the worker from the Work immediately, and shall not again employ the removed worker on the Work except with the written consent of the City.

Section 5.06. No Tenancy.

All workers, contractors, or contractors' representatives are admitted to the Site only for the proper execution of the Work, and have no tenancy.

Section 5.07. Separate Contracts.

The City reserves the right to do other work in connection with the Project by separate contract or otherwise. The Contractor shall at all times conduct its work so as to impose no hardship on the City or others engaged in the Work. The Contractor shall afford other contractors reasonable opportunity for the delivery and storage of materials and the execution of their work. The Contractor shall adjust, correct and coordinate its work with the work of others so that no delays or discrepancies shall result in the whole Project.

It shall be the duty of the Contractor and its Subcontractors, before beginning any work, to examine all construction and work of other contractors and/or Subcontractors that may affect their work, and to satisfy themselves that everything is in proper condition to receive such work. The Contractor shall notify the Owner's Representative in writing prior to starting work of any discrepancies or conditions which deviate from the Contract Documents or are otherwise unsuitable for proper execution and results. Failure on the part of the Contractor to so inspect and promptly notify the Owner's Representative shall constitute an acceptance by the Contractor and all Subcontractors of all construction in place as being suitable in all respects to receive further work by the Contractor or Subcontractors, unless defects develop in the other contractor's work after the execution of the Contractor's Work.

Section 5.08. Cooperation with Other Contractors.

The City or adjacent property owners may perform work adjacent to or within the Work areas concurrent with the Contractor's operations. The Contractor shall conduct operations to minimize interference with the work of other forces or contractors. Any disputes or conflicts between the Contractor and other forces or contractors retained by the City which create delays or hindrance to each other shall be referred to the City for resolution.

#### Section 5.09. Contractor's Equipment.

The Contractor shall provide adequate and suitable equipment, labor and means of construction to meet all the requirements of the Work, including completion with the Contract Time. Only equipment suitable to produce the quality of work required will be permitted to operate on the Project. Specific types of equipment may be requested by the City on component parts of the Work.

The City may, at the City's option, permit the use of new or improved equipment. If such permission is granted, it is understood that it is granted for the purpose of testing the quality and continuous attainment of work produced by the equipment, and the City shall have the right to withdraw such permission at any time that the City determines that the alternative equipment is not producing work that is equal in all respects to that specified in the Contract.

In any case where the use of a particular type or piece of equipment has been banned, or in cases where the City has condemned for use on the Work any piece or pieces of equipment, the Contractor shall promptly remove such equipment from the site of the Work. Failure to do so within a reasonable time may be considered a breach of contract.

#### Section 5.10. Submittals.

The Contractor, at its sole cost and expense, shall furnish to the Owner's Representative all Submittals and other descriptive material as are required by the specifications or requested by the Architect or Consulting Engineer to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Plans and Specifications. Submittals shall include, but not be limited to, all mechanical and electrical equipment and systems, reinforcing steel, fabricated items and piping details.

Shop Drawings shall be done with sufficient detail to adequately describe items proposed to be furnished or methods of installation to enable the City and Architect or Consulting Engineer to determine compliance with the Specifications and with the design and arrangement shown on the Working Drawings.

Electrical, instrumentation, control and communication system drawings shall include elementary and loop diagram drawings, functional single line system layout drawings, connection drawings, interconnection drawings, panel/cabinet fabrication drawings, and detailed circuit board and component drawings. Detailed circuit schematics and circuit board layout drawings shall be provided which clearly show, locate and identify all components and wiring. Each circuit board component shall be identified by the component's original manufacturer name and part number. Industry standard part numbers shall be used. Component values, voltage/current levels, setpoint, and timing values shall be defined.

Complete annotated software/firmware source code listings and program documentation shall be provided for all electronic/electrical systems, subsystems, assemblies, parts, components and equipment which incorporate programmable devices. All instructions and hardware necessary to load, store, modify and activate software/firmware source codes and programs shall be provided. The Contractor shall check and coordinate all Submittals with the work of all trades involved before they are submitted. The Contractor shall review each submittal for conformance with the requirements of the Contract Documents.

Unless otherwise provided in the Contract Documents, all Submittals for the Project shall be made within thirty-five (35) Calendar Days of the Notice to Proceed; however, the Contractor



shall have the additional responsibility to coordinate the schedule of its Submittals with the requirements of the Contract Schedule so as not to delay the Project. No delay claims related to Submittals will be entertained on the Project for any Submittal originally received after the 35 day submittal period. The City shall not accept limitations in materials, colors, quality, or any other aspect of products or materials due to the Contractor's failure to provide Submittals as required. At the City's discretion, the Contractor may be directed to furnish and install temporary materials until the City selected material is available.

Contractor shall submit a schedule of Submittals organized by specification section required for the Project. It shall delineate whether product data, installation instructions, shop drawings, samples, extra stock or mock-ups are required. This schedule of Submittals shall be submitted prior to the issuance of the Notice to Proceed. Any omissions or inaccuracies shall not relieve the Contractor of the obligation for conforming to the requirements in the Contract Documents. The Contractor's submittal schedule shall provide sufficient time for delivering the Submittal to the Architect or Consulting Engineer, the Architect's or Consulting Engineer's review of each Submittal, delivering the Submittal to the Contractor and re-submittal as necessary. In no case shall the Contractor allow fewer than twenty-one (21) Calendar Days, exclusive of delivery time, for the Owner's Representative and the Architect or Consulting Engineer to review each Submittal. In certain cases, the Contract Documents also may require City review of Submittals. In those cases, in addition to the time allowed for review by the Owner's Representative and the Architect or Consulting Engineer, the Contractor shall allow no fewer than fourteen (14) additional Calendar Days for that City review.

A. Submission of Submittals.

The Contractor shall submit no less than one reproducible and six (6) copies of all Submittals, two (2) of which shall be returned after review. The Submittals shall be accompanied by a letter of transmittal, to the Owner's Representative, listing the identifying number of the Submittals submitted and cross-referencing them to the page or sheet in the Specifications and/or Working Drawings to which they are related.

Where any items of the Works is required to be installed in accordance with the manufacturer's installations recommendations, the Contractor shall furnish six (6) complete sets of the manufacturer's installation recommendations to the Owner's Representative prior to starting the installation. These submittals will be retained by the City.

All Submittals must be marked with the name of the Project and the name of the Contractor and shall be numbered consecutively and complete in every respect.

By approving and submitting Submittals, the Contractor represents that it has determined and verified all materials, field measurements and field construction criteria related thereto and that it has checked and coordinated the information contained within those Submittals with the requirements of the Work and to the Contract Documents. The Contractor shall adhere to any supplementary processing and scheduling instructions pertaining to Submittals as may be issued by the Owner's Representative.

The Owner's Representative will not accept Submittals which are not sufficiently dimensioned and detailed to demonstrate compliance with the Contract Documents.

B. Submittals Containing Proprietary Information.

All required information shall be provided even though some or all of such information may be considered proprietary. If any of the information required herein is considered proprietary, the City's standard proprietary agreement shall be executed between the City and the Contractor, stipulating that all such information will be supplied by the Contractor and kept confidential by the City. All proprietary data shall be identified as part of the Contractor's bid and the City's standard proprietary agreement shall be executed before award of the Contract. Proprietary information is defined as any information or data describing or defining a product, process or system which (1) was developed at the expense of the Contractor, a subcontractor or supplier; (2) is not generally available in the industry; and (3) is kept secret by its owner for purposes of preventing its use by others. Application software and all other documentation, or any other product, prepared by the Contractor, Subcontractor or supplier at the expense of the City for specific use on the facility being construction under the Contract Documents shall not be considered proprietary.

Not more than seventy percent (70%) of all electronic/electrical work shall be paid for until all proprietary information has been submitted and approved.

All submitted proprietary information shall describe the final record Work. No part of the Work covered by the proprietary agreement shall be modified after proprietary submittal acceptance until updated proprietary information has been submitted by the Contractor and accepted by the City. Updated proprietary information shall fully document all modifications to be implemented. All proprietary data shall be marked "PROPRIETARY" by the Contractor.

C. Review of Submittals.

Following submission, the Submittals will be returned with one or more of five possible responses by the Owner's Representative, Architect or Consulting Engineer. These possible responses are as follows:

1. Unreviewed: If the Submittal is not required, or if it is not complete, or if it does not meet the form, format, and number requirements specified, it may be returned unreviewed. If the Submittal is not required, work may commence; if the Submittal was returned due to form requirements, it shall be resubmitted and approval obtained prior to commencement of the work.
2. Approved, Reviewed, or No exceptions taken: In the event the Submittal is acceptable as submitted, it will be returned with this status. Work may proceed upon receipt of approved Submittal.
3. Make Corrections Noted: If the Submittal is acceptable except for certain items which have been noted by the Architect or Consulting Engineer, it will be so designated. Work may proceed with the corrections made, and no resubmittal is necessary.
4. Revise and Resubmit: This status indicates that revisions are noted on the Submittal, and an additional Submittal is required to reflect those revisions and/or additional information. Work may not commence until the resubmittal is approved.
5. Rejected: A Submittal may be rejected if it is not in compliance with the Contract



Documents, or if it proposes an "or equal" or substitution which is not acceptable to the Architect or Consulting Engineer. A superseding Submittal shall be submitted and approved prior to commencement of the work.

Should the Contractor proceed with the work shown on a Submittal before approval is received, it shall remove and replace or adjust any work which is not in accordance with the Submittal as ultimately approved, and it shall be responsible for any resultant damage, defect, or added cost. The City shall be under no obligation to pay for work installed prior to approval of Submittals, until the Submittals are approved and the work in place is found to be in compliance with the Contract Documents.

The Contractor shall resubmit Submittals in categories 4 and 5 above after making any changes required so that Submittals will comply with the Contract Documents. When resubmitting, the Contractor shall direct specific attention to deficient areas. Resubmittals shall be made in the same number of copies as the original Submittal. Resubmittals shall be made within ten (10) Calendar Days of return of the previous Submittal, and in any event in sufficient time so as to avoid delay to the Work. No delay claims related to resubmittals will be entertained on the Project for any resubmittal originally received after the 10 days.

The Architect or Consulting Engineer shall determine the adequacy and completeness of all Submittals. Where the Architect or Consulting Engineer deems a Submittal to be inadequate, incomplete, or otherwise unsuitable for proper review, the Contractor shall submit all additional information requested by the Architect or Consulting Engineer. There shall be no change to the Contract Time or the Contract Sum when such additional information is required.

**D. Submittals Showing Variation from Contract.**

It shall be the responsibility of the Contractor to specifically point out any variation or discrepancy between the Submittals submitted and the Contract Documents. The Contractor shall make specific mention of all variations, along with an explanation of why they are requested, in its letter of transmittal. Failure by the Contractor to identify in its letter of transmittal any variation, discrepancy, or conflict with the Contract Documents shall render the approval null and void, and the Contractor shall bear all risk of loss and reconstruction costs or delays.

If any modifications to the Work are required as a result of the approval of Submittals which deviate from or do not comply with the Contract Documents, those modifications shall be made without extra cost to the City, and without extension of the Contract Time. Any other resultant costs, including but not limited to design fees, construction management fees, costs incurred by other contractors, or inspection fees, shall be at the expense of the Contractor.

**E. Effect of Approval of Submittals.**

The approval of Submittals shall not relieve the Contractor of the obligation for accuracy of dimensions and details; for conforming the work to the requirements of the Contract Documents; or from responsibility to fulfill the Contract at no extra cost to the City, within the Contract Time.

The Contractor shall make no changes to any Submittal after it has been approved, and the equipment or materials shall not deviate in any way except with the written approval of the City.

F. Operations and Maintenance (O&M) Submittals.

For use in subsequent maintenance and operations the Contractor shall furnish, unless otherwise provided for in the Special Provisions, operation and maintenance ("O&M") information in accordance with Article 18 of these General Provisions. The City may withhold retention until O&M submittals have been submitted and approved.

Section 5.11. Equal Materials.

Unless otherwise provided in the technical specifications, whenever in the Contract Documents any systems, processes, products, or materials are indicated or specified by the name brand of the manufacturer, or by patent or proprietary names, those specifications shall be deemed to be a measure of quality and utility or a standard, and shall be deemed to be followed by the words, "or equal." It is the intent of this Article to comply with Public Contract Code Section 3400.

If the Contractor desires to use any other brand or manufacturer of equal quality and utility to that specified, it shall make application to the Owner's Representative in writing, within ten (10) business days after Notice to Proceed, and shall submit samples and all other information necessary to substantiate its claim of "or equal". Such application constitutes a certification that the Contractor:

- A. Has investigated the proposed Equal and determined that it meets or exceeds, in all respects, the specified system, process, product, or material.
- B. Will provide the same warranty for the proposed Equal as for the specified system, process, product or material.
- C. Will coordinate installation and make other changes which may be required for work to be complete in all respects and at no additional cost to the City.
- D. Waives claims for additional costs and/or Contract Time which may subsequently become apparent.

The Architect or Consulting Engineer then will determine whether or not the proposed system, process, product or material is equal in quality and utility to that specified, and its decision shall be final. The Architect or Consulting Engineer will render its decision within fourteen (14) business days after submission of all required information for the application. If the request is not accepted, the Contractor shall provide the specified system, process, product or material without an increase in the Contract Sum and/or Contract Time.

Neither the submission of a request for an Equal, nor the Architect's or Consulting Engineer's review of the application, will extend the time for submission of any required Submittals. Requests for Equal systems, process, products or materials will be considered only when offered by the Contractor as required by this Article.

Section 5.12. Substitutions.

Unless otherwise provided in the technical specifications, the Contractor may make proposals for Substitutions to systems, process, products or materials shown or specified only under one or more of the following conditions:

- A. Unavailability: If the specified system, process, product, or material, or an Equal, is no longer available in the marketplace.
- B. Delay: If obtaining the specified system, product, process or material, or an Equal, will delay completion of the Work through no fault of the Contractor.
- C. Better system, process, product or material: If a better system, product, process or material is available at no additional cost.
- D. Savings: If a system, process, product or material which meets all of the performance requirements of that specified is available at a savings to the City.

A proposal for Substitution shall include all information required by the Architect or Consulting Engineer to evaluate the substitute system, process, product or material. Such proposal constitutes a certification that the Contractor:

- A. Has investigated the proposed Substitution and determined that it meets or exceeds the performance requirements of the specified system, process product or material.
- B. Will provide the same or better warranty for the proposed Substitution as for specified system, process, product or material.
- C. Will coordinate installation and make other changes which may be required for the work to be complete in all respects at no additional cost to the City.
- D. Waives claims for additional costs and/or Contract Time, which may subsequently become apparent.

The Owner's Representative and the Architect or Consulting Engineer shall evaluate a timely Substitution request, and shall approve, deny, approve with conditions, or initiate the procedure for a change order in response to the Contractor's request. This decision shall be final. This decision will be rendered within fourteen (14) business days after submission of all required information for the proposal. If the request is not accepted, the Contractor shall provide the specified system, process, product or material without an increase in the Contract Sum and/or Contract Time.

Failure by the Contractor to identify all deviations from the Contract Documents in its request for substitution shall render any City action taken thereon null and void. The Contractor shall bear all costs resulting from any error in the request for Substitution. Only one request for Substitution will be considered for each product.

Substitution proposals will not be considered prior to bidding. All requests for Substitutions shall be made within the same time requirement for initial Submittals. Failure to timely submit a Substitution request shall constitute a waiver by the Contractor and an acceptance of the specified systems, processes, products and materials. Late substitution requests may be considered only when the City consents in writing, and the City's best interests so require.

Neither the submission of a request for substituted systems, processes, products or materials, nor the Owner's Representative's and/or Architect's or Consulting Engineer's review of the application, will extend the time for submission of any required Submittals.

Section 5.13. Samples and Testing of Proposed Substitutions; Costs of Adapting to Work.

When the Owner's Representative or Architect or Consulting Engineer determines that samples and testing are required to evaluate a request for a Substitution, the Owner's Representative shall so advise the Contractor, and specify the systems, processes, products, materials or work to be sampled. The Contractor shall, at no cost to the City, provide samples as required by these General Conditions dealing with samples and testing, or the Technical Specifications.

The Contractor shall bear all costs of sampling and testing required to decide a request for Substitution, and if a Substitution is accepted, the Contractor shall bear all costs associated therewith, including the cost of the Owner's Representative's, Architect's and/or Consulting Engineer's services required to adapt the Substitution to the design to the complete satisfaction of the City, and all costs of mechanical, electrical, structural, or other changes needed to adapt the Substitution to the Work.

Section 5.14. Effect of Approval of Equal Materials or Substitution Request.

If an application for an Equal or Substitution request is approved, the Contractor shall be solely and directly responsible for setting approved Equal or Substitution systems, processes, products, materials and/or equipment into the available space, and for the proper operation of the Equal or Substitution systems, process, products, materials and/or equipment with all other systems, processes, products, materials and/or equipment with which it may be associated, all in a manner acceptable to the City.

No time extensions nor any increases in the Contract Sum shall be granted on account of an Equal or Substitution. In the event of a savings, the Contract Sum shall be adjusted by the price difference between the approved Equal or Substitution and the originally specified item.

Section 5.15. Surveys.

A. Contractor Surveys.

Except as set forth in the Special Provisions, the Contractor is responsible to do all necessary surveys to layout and control the Work to the locations, elevations, lines and dimensions shown or specified in the Contract Documents. Any deviations must receive prior approval of the City. All surveys affecting the line or elevation of underground drainage, sewers, or utilities, and all other work within public rights-of-way or easements shall be performed by or under the direction and supervision of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice land surveying.

The Contractor shall be responsible for protecting and perpetuating survey monuments affected by construction activities in accordance with Business and Professions Code section 8771. The Contractor shall be responsible for referring, resetting, and filing of corner records for all survey monuments disturbed or destroyed by construction activities in accordance with Business and Professions Code section 8771.

The Contractor shall be responsible for the accuracy of the Contractor's own layout work, and shall be liable for the preservation of all established lines and grades. Stakes

damaged or destroyed by the operations of the Contractor shall be replaced at the Contractor's expense.

#### B. City-Furnished Surveys.

If the Special Provisions provide that surveys will be furnished by the City, the Contractor shall notify the City at least two (2) Working Days in advance of the time and places the Contractor will need lines, elevations, and reference points. Unless authorized by the City, any work done without line and grade will be done at the Contractor's risk.

Unless otherwise set forth in the Special Provisions, the City will furnish the following surveys:

##### 1. For Streets and Highways:

Slope Stakes – One (1) line of slope stakes at fifty-foot (50') intervals for the construction of each pavement edge. The Contractor shall set back and reference the stakes.

Subgrade – One (1) line of blue tops at centerline or at a location directed by the City, for each of two (2) lanes of roadway at fifty-foot (50') intervals, and three (3) lines on super-elevated sections for each two (2) lanes. The Contractor shall reference subgrade stakes for the subbase and base layers.

Finish Base – One (1) line of blue tops at centerline or at a location directed by the City for each two (2) lanes of roadway at fifty-foot (50') intervals, and three (3) lines for each two (2) lanes on super-elevated and widened sections.

All necessary line, location and elevation stakes for curb and gutter, inlets, pipes, drainage structures, signals, box culverts and other miscellaneous facilities.

#### C. Survey Monuments.

On the Plans, the City shall show, to the best of its knowledge, the location and character of survey monuments located within the construction area. It is the Contractor's responsibility to arrange and pay for a diligent and thorough search for survey monuments. This work shall be performed by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice land surveying, prior to the beginning of construction or maintenance work that could disturb or destroy a survey monument. Any monuments found shall be referenced and reset by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice land surveying in accordance with Business and Professions Code section 8771. On thin surface treatments, such as chip seals, the monuments can be covered in advance of the maintenance treatment with a suitable material and then removed to expose the monument. When survey monuments not shown on the Plans are discovered, the Contractor shall bring them to the attention of the City prior to damaging them. Any damaged or destroyed City survey monuments shall be reset by the City at the Contractor's expense. Any other damaged or destroyed survey monuments shall be reset by the Contractor in accordance with the Land Surveyors Act, Business and

Professions Code section 8700 et seq.

All survey monuments and references shall be set or reset by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice land surveying.

Section 5.16. Responsibility for Accuracy.

The Contractor shall obtain all necessary measurements for and from the Work, and shall check dimensions, elevations and grades for all layout and construction work and shall supervise such work, the accuracy for all of which the Contractor shall be responsible. The Contractor is responsible for adjusting, correcting and coordinating the work of all Subcontractors so that no discrepancies result.

Section 5.17. Quality of Materials and Products.

Unless otherwise allowed or required by the Special Provisions, all materials shall be new and of a quality at least equal to that specified. When the Contractor is required to furnish materials or manufactured articles for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market. If not ordinarily carried in stock, the articles shall conform to the usual standards for first-class materials or articles of the kind required. The work performed shall secure the best standard of construction and equipment of the work as a whole or in part. The Contractor shall, if required by the Architect, Consulting Engineer, Project Inspector, or Owner's Representative, furnish satisfactory evidence as to the kind and quality of materials provided.

The Owner's Representative may require, and the Contractor shall submit if required, a list designating the source of supply of each item of materials incorporated into the Work, and in such event, those materials or products shall not be delivered to the Work nor installed therein until after the Owner's Representative has approved the list.

Contractor shall certify that the materials and equipment installed comply with the Contract Documents.

In the event that the Contractor furnishes a material, product, process, or article better than that specified in the Contract Documents, the difference in cost of that material, product, process, or article shall be borne by the Contractor.

All materials shall remain in their original packages or containers until ready for use. The labels of all packages or containers shall remain affixed, and kept legible. No product shall be stored in any container, the label of which does not accurately describe the contents of the container.

All materials furnished shall comply with industry standards as follows:

- A. Any material specified by reference to the number, symbol, or title of a specified standard such as a Commercial Standard, a Federal Specification, a Trade Association Standard, or other similar standard, shall comply with the requirements in the latest revision thereof, including any amendments or supplements thereto, in effect on the date of the Bid, except as limited to type, class, or grade, or modified in that reference.



- B. The standard referred to, except as modified in the specifications, shall have full force and effect as though printed in these specifications. These standards are not furnished to the bidder for the reason that the manufacturers and trades involved are assumed to be familiar with their requirements.
1. Where Federal Specifications are referred to as a measure of quality and standard, they refer to Federal Specifications established by the Procurement Division of the United States Government and are available from the Superintendent of Documents, U.S. Government Printing Office.
  2. Where Federal Specification numbers are used, they refer to the latest edition including amendments thereto.
  3. Where Commercial Standards (CS) or Product Standards (PS) are referred to as a measure of quality, standard, and method of fabrication, they refer to Commercial Standards and Product Standards issued by the U.S. Department of Commerce.
  4. Where ASTM serial numbers are used, they refer to the latest tentative specifications, standard specifications, standard method or standard methods of testing, issued by the American Society for Testing Materials, unless specifically noted.

The Contractor shall protect the work, materials, and equipment from damage due to the action of the elements, trespassers, or other causes. The Contractor shall properly store materials and equipment and, when necessary, erect temporary structures to protect them from damage. The Contractor shall replace any items damaged as a result of improper protection at no expense to the City.

Section 5.18. Property Rights in Materials.

Nothing in the Contract Documents shall be construed as vesting in the Contractor any right of property in the materials used, after they have been installed, attached or affixed to the work, but all such materials shall be the property of the Contractor and the City jointly as their interest may appear and cannot be removed from the work without the consent of the City.

Section 5.19. Inspection.

All work done and all materials and equipment furnished shall be subject to the inspection and approval of the City. Neither the final inspection and payment, nor any interim inspection or progress payment shall relieve the Contractor of its obligation to fulfill the Contract as required by the Contract Documents. Any work, materials or equipment not meeting the requirements and intent of the Contract Documents may be rejected, and unsuitable work or materials shall be made good, notwithstanding the fact that such work or materials may previously have been inspected and/or payment therefor may have been made.

The Project Inspector shall be considered to be a representative of the City and shall be designated at the pre-construction conference. It is the Project Inspector's duty to inspect the Work.

Where the Contract Documents, instructions by the Project Inspector, Owner's Representative or the Architect or Consulting Engineer, laws, ordinances, or any public authority having jurisdiction require work to be inspected, tested or approved before the Work proceeds, such work shall not proceed, nor shall it be covered up without inspection. If any part of the Work is covered prior to inspection, the City may order the work to be uncovered so that inspection may be accomplished. The Contractor shall bear all expenses of such examination and satisfactory reconstruction.

The Contractor shall provide written notice to the Project Inspector at least twenty-four (24) hours in advance of the readiness for inspection.

All work shall be available for inspection and the Project Inspector shall have full access to review all work during all working times. The Contractor shall provide all necessary means of safe access (e.g. ladders) for the Project Inspector to perform his/her duties. The Contractor shall furnish the Project Inspector with any information necessary to fully inform him/her of conditions.

The Project Inspector shall have the authority to order the work designated for inspection stopped if a determination is made that work is proceeding in violation of the Contract Documents or any orders issued by the City, its representatives, or the Architect or Consulting Engineer. The failure of the Project Inspector to order the work stopped does not excuse the Contractor from complying with the Contract Documents for that work. Upon issuing a stop work notice, the Project Inspector shall notify the Architect or Consulting Engineer, who shall inspect the work in question and determine whether it does or does not comply with the Contract Documents. The decision of the Architect or Consulting Engineer shall be final. The Contractor shall thereafter comply with the instructions of the Architect or Consulting Engineer regarding corrections needed to cure the defect. The suspended work shall be resumed only when the instructions are fulfilled. The Contractor shall not be entitled to an extension of time in the event of such suspension of work.

Should the Owner's Representative or the Architect or Consulting Engineer determine that it is necessary or advisable to make an inspection of work already completed at any time before final inspection and acceptance of the Work, by removing or exposing any work, the Contractor shall, upon instruction of the Owner's Representative, promptly furnish all necessary facilities, labor, and materials to do so. If the work is found to be defective in any respect due to the fault of the Contractor or any Subcontractor, the Contractor shall bear all expenses of such examination and satisfactory reconstruction. If, however, the work is found to meet the requirements of the Contract Documents, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor and a change order shall be issued for such cost and any time extension justified by delays to the critical path.

Whenever the Contractor arranges to work at night or any time when work is conducted other than the normal 8-hour work day or 40-hour week, or to vary the period during which work is carried on each day, it shall give the Owner's Representative and the Project Inspector a minimum of 48-hours notice so that inspection may be provided. Additional inspection costs incurred because of overtime or shift work that are incurred at the request of the City shall be paid by the City. All other additional inspection costs shall be borne by the contractor unless otherwise agreed to by the parties. If this overtime work is necessitated by the Contractor's error or failure to perform, the cost of inspection will be borne by the Contractor.



Section 5.20. Plant Inspection.

The City may inspect the production of materials or manufacture of products at the source of supply. Plant inspection, however, will not be undertaken until the City is assured of the cooperation and assistance of both the Contractor and the material producer. The City or the Contractor's authorized representative shall have free entry at all time to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection and tests.

The City assumes no obligation to inspect materials at the source of supply. The responsibility of incorporating satisfactory materials in the Work rests entirely with the Contractor, notwithstanding any prior inspections or tests.

Section 5.21. Samples and Testing.

The City reserves the right to require the Contractor to provide samples, and to perform tests on any materials, articles, equipment, installations, or construction performed by the Contractor in addition to those specified in the Contract Documents. The City shall assume the cost of sampling and testing materials only when the Contract Documents do not require the Contractor to do so.

All tests shall be performed under the supervision of the testing laboratory or consultant employed by the City and at such times as are convenient to the City. The Contractor shall provide written notice to the Owner's Representative at least 24 hours prior to the need for off-site tests or inspections, and the Owner's Representative will arrange such tests or inspections. The Contractor shall bear all expenses of tests performed where the Contractor failed to provide this minimum notice.

The Contractor shall, at its sole cost and expense, repair all damage resulting from testing specified in the Contract Documents. The City shall issue a Change Order for repair of damage due to sampling or testing other than specified in the Contract Documents.

The Contractor shall not make any tests upon portions of the Project already completed, except with the prior written consent and under the direction and supervision of the Owner's Representative.

If as a result of any test, whether originally specified or not, any material or work is found to be unacceptable, it shall be rejected, and all further sampling and testing required by the City or the Owner's Representative shall be at the Contractor's expense.

All samples and specimens for testing shall be selected by the Project Inspector or by the testing laboratory, but not by the Contractor.

The Contractor shall, at the Contractor's sole cost and expense, furnish, package, mark, and deliver all samples to be tested at locations other than the Site. Samples shall be delivered either to the Project Inspector or to the testing laboratory or such other address specified in the Contract Documents.

Delivery of all samples to the testing laboratory shall be made in ample time to allow the test to

be made without delaying construction. No extra time will be allowed for the completion of the Work by reason of delay in testing samples required by the Contract Documents or due to the Contractor's request for substitution.

The Contractor shall allow free access at all times to the representatives of the testing laboratory to the Work, and shall point out the sources from which samples are taken. All test reports shall be sent to all parties specified in the Contract Documents.

No materials or work of which samples and/or tests are required shall be used or covered until the Owner's Representative or the Project Inspector informs the Contractor that such samples and/or tests have been approved. If the Contractor installs, uses, or covers any such material, article, or work prior to testing and approval, such shall be at the Contractor's sole risk and expense, and it shall bear all costs of uncovering, repair, and replacement thereof.

The approval of any samples shall be for the characteristics thereof, or for the uses named in such approval, and no other. No approval of any samples shall be deemed a change or modification in any requirement of the Contract Documents. Upon testing of any sample of material or work, no additional sample shall be considered. All material or work installed after the sampling and testing is performed and approved shall be equal to or better than the approved sample in all respects and shall be accompanied by documentary proof that the material and work sampled is actually representative of that installed.

The City assumes no obligation, and the Contractor shall not be relieved of any obligation undertaken pursuant to the Contract Documents by virtue of sampling and testing specified in this Article.

The responsibility for incorporating satisfactory materials and workmanship which meet the Contract Documents in the work rest entirely with the Contractor, notwithstanding any prior samples or tests.

#### Section 5.22. Rejection of Materials and Workmanship.

The City shall have the right to reject materials and workmanship which are determined by the Owner's Representative, the Architect, Consulting Engineer, or the Project Inspector to be defective or fail to comply with the Contract Documents. Rejected workmanship shall be promptly corrected to the satisfaction of the City and/or Architect or Consulting Engineer, and rejected materials shall be removed from the premises and replaced, all without added cost to the Owner and/or an increase in the Contract Time.

If the Contractor does not correct such rejected work and/or materials within a reasonable time, fixed by the Owner's Representative or the Architect or Consulting Engineer in a written notice to the Contractor, the City may correct the same and charge the expense to the Contractor, and deduct such expense from the next progress payment otherwise payable to the Contractor.

If the City determines that it is in its best interest not to correct defective workmanship and/or materials, or work not done in accordance with the Contract Documents, the Contractor agrees that an equitable deduction from the Contract Sum shall be made therefor, and deducted from the next progress payment.

#### Section 5.23. Correction of Work

The Contractor shall promptly correct all work rejected by the Owner's Representative, Project Inspector or the Architect or Consulting Engineer as defective or as failing to conform to the Contract Documents, whether observed before or after final completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected work including compensation for the Architect's, Consulting Engineer's Project Inspector's and the Owner's Representative's additional services.

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within three (3) days after receipt of written notice from the City to commence and continue correction of the default or neglect with diligence and promptness, the City may, without prejudice to any other remedy it may have, correct the deficiencies and may further elect to complete that portion of the Work through such means as the City may select, including the use of a new contractor. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting the deficiencies, and any other appropriate costs, including compensation for the Architect's or Consulting Engineer's, the Project Inspector's and the Owner's Representative's additional services made necessary by the default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover that amount, the Contractor shall pay the difference to the City.

If within two (2) years after the Date of Completion and acceptance of the Work or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct any or all such work, together with any other work which may be displaced in so doing, without expense to the City, promptly after receipt of a written notice from the City unless the City has previously given the Contractor a written acceptance of such condition. The City shall issue a correction notice promptly after discovering the condition. The Contractor shall notify the City upon completion of repairs. This obligation shall survive termination of the Contract with respect to work in place prior to termination.

The Contractor shall bear the cost of making good work destroyed or damaged by such correction or removal.

Nothing contained in this Section shall be construed to establish a period of limitation with respect to any other obligations which the Contractor might have under the Contract Documents or by operation of law. The establishment of the time period of two (2) years after the Date of Completion, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the Work and has no relationship to the time within which an action may be Commenced to establish the Contractor's liability with respect to its obligations other than specifically to correct the work.

#### Section 5.24. Termination for Convenience.

The City may at any time and for any reason, terminate, in whole or in part, Contractor's Work at the City's convenience. Termination shall be by written notice to Contractor. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue

Contractor's work and the placing of orders for materials, facilities and supplies in connection therewith, and shall, if requested, make every reasonable effort to procure cancellation of all existing orders or contracts upon terms satisfactory to the City, or at the option of the City, the City shall have the right to assume those obligations directly, including all benefits to be derived therefrom. Contractor hereby assigns to the City all of its interest in said orders and/or contracts, and the assignment of said orders and/or contracts shall be effective upon notice of acceptance by the City in writing, and only as to those orders and/or contracts which the City designates in writing. Following receipt of notice of termination, Contractor shall thereafter do only such work as may be necessary to preserve and protect portions of its work already in progress and to protect materials and equipment on or in transit to the Project.

Upon such termination, Contractor shall be entitled to payment only as follows: (1) Contractor's direct, actual cost of the Work allocable to the portion of the Work completed in conformity with the Contract, but in no event to exceed the amount of the Contract Sum allocable to the portion of the Work completed in conformity with the Contract; plus (2) previously unpaid costs of any items delivered to the Project Site which were fabricated for subsequent incorporation in the Work, but in no event to exceed the portion of the Contract Sum allocable to said items; plus (3) an allowance of ten percent (10%) of the foregoing costs for Contractor's overhead and profit; plus (4) any proven losses with respect to materials and equipment directly resulting from the termination; plus (5) reasonable demobilization costs. The costs referred to in this Section shall be calculated and documented as required for a Change Order under Article 9 of these General Provisions, except that markup shall be only as allowed by this Section. There shall be deducted from such sums the amount of any payments made to Contractor prior to the date of the termination of this Contract. Contractor shall not be entitled to any claim or claim of lien against the City for any additional compensation or damages in the event of such termination and payment beyond that provided for in this Section.

In connection with any termination for convenience, Contractor shall allow the City and any of its authorized representatives to inspect, audit, or reproduce any records to the extent necessary for the City to evaluate and verify the costs incurred by Contractor in performing the Work, including direct and indirect costs such as overhead allocations. Contractor will make this material available upon 48-hours' written notice from the City. The City may inspect and copy, from time to time and at reasonable times and places, any and all information, materials and data of every kind and character (hard copy, as well as computer readable data if it exists), including without limitation, books, papers, documents, subscriptions, recordings, estimates, price quotations, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers, monthly, quarterly, yearly or other financial statements, and any and all other information or documentation that may, in the judgment of the City have any bearing on or pertain to any matters, rights, duties, or obligations under or covered by the Contract Documents. Such records shall include but not be limited to, the following: accounting records, payroll records, job cost reports, job cost history, margin analysis, written policies and procedures, subcontract files (contracts, correspondence, change order files, including documentation covering negotiated settlements), backcharge logs and supporting documentation, general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends, and any other documents customarily maintained by contractors performing work on public works projects or that the City otherwise deems necessary to substantiate charges related to a Termination.

If this Contract is terminated for default under Section 5.25, and if it is later determined that the default was wrongful, such default termination automatically shall be converted to and treated

as a termination for convenience under this Section. In such event, Contractor shall be entitled to receive only the amounts payable under this Section, and Contractor specifically waives any claim for any other amounts or damages, including any claim for consequential damages or lost profits.

Section 5.25. Termination for Cause.

The City may terminate the Contract, pursuant to the provisions of this Article, for the following causes:

- A. The Contractor is insolvent or has made a general assignment for the benefit of creditors, or a receiver has been appointed on account of the insolvency of the Contractor.
- B. The Contractor or any of its Subcontractors violate any of the provisions of the Contract Documents or fail to perform the work within the time specified in the current Contract Schedule.
- C. The Contractor or any of its Subcontractors should fail to make prompt payment to Subcontractors or material suppliers for material or for labor as required by statute.
- D. The Contractor or a Subcontractor persistently disregards laws, ordinances, or the instructions of the Owner's Representative, Architect, Consulting Engineer or the City.
- E. The Contractor fails to abide by a Stop Work Notice or fails to correct rejected work or materials as required.
- F. The Contractor fails to provide and keep in full force and effect all required insurance, or fails to cause all Subcontractors to so comply.
- G. The Contractor fails to supply a sufficient number of properly skilled workers or proper materials.
- H. The Contractor commits any substantial violation of the terms and conditions of the Contract Documents which the City, in its sole discretion, finds to be a material breach of the Contract.

The City may, without prejudice to any other right or remedy, give written notice to the Contractor and its surety or sureties of its intention to terminate the Contract.

Unless within seven (7) Calendar Days of the delivery of such notice, the Contractor shall cease such violation and make satisfactory arrangements for a correction thereof, which arrangements are set forth in a written agreement signed by the Contractor and the City, the Contractor's right to complete the Work shall cease and terminate.

In the event of any such termination, the City shall immediately give written notice thereof to the surety and to the Contractor and the surety shall have the rights and obligations set forth in the performance bond. If the City is forced to take over the Work, it may prosecute the same to completion by contract or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and its sureties shall be liable to the City for

any excess costs, including management, supervision, and design support, occasioned thereby. In such event, the City may, without liability, take possession of and utilize in completing the Work, the Contractor's materials whether stored at the Site or elsewhere, that are necessary for completion. Contractor hereby assigns to the City all of its interest in orders and/or contracts existing at the time of termination. The assignment of said orders and/or contracts shall be effective upon notice of acceptance by the City in writing, and only as to those orders and/or contracts which the City designates in writing. Whenever the Contractor's right to proceed is terminated, the Contractor shall not be entitled to receive any further payment until the Work is finished.

Section 5.26. Option in Event of a Loss.

In the event that any destruction or loss should exceed twenty percent (20%) of the value of the construction completed to date, as determined at the end of the preceding month, or is due to an "Act of God," the City shall have the option, at its sole discretion, to terminate this Contract.

Section 5.27. Provisions for Termination of Contract.

This Contract is subject to termination as provided by Sections 4410 and 4411 of the Government Code, being portions of the Emergency Termination of Public Contracts Act of 1949.

Section 5.28. Termination After Contract Time.

In addition to any rights it may have, the City may terminate this Contract at any time after the Contract Time, as adjusted by any extensions of time that the City may have granted.

Upon such termination, in addition to the Contractor's obligations under Section 5.29 and the other provisions of the Contract Documents, the Contractor shall not be entitled to receive any compensation for services rendered before or after such termination until the Work is completed, and the Contractor shall be liable to the City for liquidated damages for all periods of time from such termination date until the Date of Completion, as well as for all losses incurred by the City in completing the Work.

Section 5.29. Survival of Obligations.

No termination of this Contract or of Contractor's Work shall excuse or otherwise relieve the Contractor of its responsibilities under the Contract Documents with respect to any Work performed prior to the date of termination, including, without limitation, its obligation to perform the Work in a good and workmanlike manner, free of defects, and in accordance with the Contract Documents, its warranty obligations with respect to the Work, and its obligation to make all payments due. All of Contractor's responsibilities under the Contract Documents with respect to the Work performed prior to the date of termination shall survive any termination.

Section 5.30. Termination of Unsatisfactory Subcontractors.

When any portion of the Work that has been subcontracted by the Contractor is not being prosecuted in a satisfactory manner, or when materials supplied do not conform to the Contract Documents, the City may direct the Contractor to discharge the Subcontractor or supplier. Any Subcontractor or supplier which is discharged shall not again be employed on this Project.

Any termination of a Subcontractor pursuant to this Section shall be in strict conformity with the requirements of the Subletting and Subcontracting Fair Practices Act, Part 1 of Division 2 of the Public Contract Code, commencing with Section 4100.



## ARTICLE 6. LEGAL RELATIONS AND RESPONSIBILITIES

### Section 6.01. Compliance with Laws and Regulations.

The Contractor shall keep itself fully informed of and shall observe and comply with, and shall cause any and all persons, firms, or corporations employed by it or under it to observe and comply with all federal and state laws, and county or municipal ordinances, regulations, orders, and decrees which in any manner affect those engaged or employed on the Work, or the materials used in the Work, or in any way affect the conduct of the Work. No pleas of misunderstanding of such laws, ordinances, codes, regulations, orders or decrees or ignorance of the same on the part of the Contractor shall modify the provisions of the Contract Documents. The Contractor and the Contractor's surety shall indemnify and save harmless the City and the City's officers, officials, agents, employees, volunteers, members, affiliates and their duly authorized representatives against any claim for liability arising from, or based upon the violation of any such law, ordinance, regulation, order or decree, whether by the Contractor, the Contractor's employees, or any Subcontractor or supplier.

Attention is directed to certain laws that affect the Contract. The listing of these laws in this Section is not to be construed as a listing of all applicable laws. The Contractor is solely responsible for familiarity and compliance with all applicable laws.

#### A. Prevailing Wage Rate.

The Contractor shall pay, and shall cause all Subcontractors under it to pay, not less than the specified prevailing wage rates, including, but not limited to, overtime, Saturday, Sunday and holiday work, travel and subsistence, to all workers employed in the execution of this Contract. Pursuant to Chapter 1 of Part 7, Division 2 of the Labor Code, commencing with Section 1770, the Director of the California Department of Industrial Relations (DIR) of the State of California has determined the prevailing rate of wages in the locality in which the work on the project is to be performed for each craft, classification, or type of worker needed to execute this Contract. The prevailing rates so determined are on file with the City Clerk and they are available for public inspection. They may also be obtained on the internet at:

<http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>

Those prevailing wage rates hereby are incorporated in this Contract and made a part hereof.

The Contractor should contact the DIR as indicated in the prevailing wage determinations to obtain predetermined wage changes. The responsibility to check prevailing wage rates is the Contractor's. In the event this Contract calls for work requiring any craft, classification, or type of worker for which the DIR has not specified a prevailing wage rate, the Contractor shall contact the Owner's Representative within ten days following the first advertisement to request a determination. After consultation with the DIR, the City will issue a determination of the prevailing wage for the specified work, and the Contractor and all Subcontractors shall pay each worker engaged in the specified work not less than those rates. Pending such determination, the wages may be assumed to be those in the applicable collective bargaining agreement, but no adjustment in the Contract Sum shall be made if such assumption is incorrect.

The Contractor shall obtain and post copies of all applicable prevailing wage rates in a prominent place at the job site, in accordance with the regulations of the Department of Industrial Relations.

**B. Hours of Work; Approval of Schedules.**

Eight (8) hours of labor constitutes a legal day's work, and forty (40) hours constitutes a legal work week. No worker employed at any time by the Contractor, or by any Subcontractor upon the Project, shall be required or permitted to work more than eight (8) hours in any one calendar day or forty (40) hours in any one week, except as provided in Labor Code Sections 1810 through 1815.

Overtime shall be paid at the rate of not less than one and one-half (1-1/2) times the basic rate of pay, or at such higher rate as may be required by the DIR, applicable statutes or collective bargaining agreements.

The City reserves the right to approve or disapprove the days scheduled for work, and the hours during which work is in progress. Overtime and shift work may be established by the Contractor with reasonable notice and the written permission of the City. No work other than overtime and shift work shall be done between the hours of 6:00 p.m. and 7:00 a.m., except such work as is necessary for the proper care and protection of the work already performed or except in case of an emergency. Failure of the Contractor to perform the work in accordance with this policy shall be deemed to be a failure on the Contractor's part to comply with the Contract and is cause for termination.

**C. Records of Hours Worked and Wages.**

All public works projects are subject to compliance monitoring and enforcement by the Department of Industrial Relations in accordance with Section 1771.4 of the Labor Code. The Contractor and all Subcontractors shall furnish the records specified in Section 1776 directly to the Labor Commissioner in accordance with Section 1771.4. The Contractor shall maintain, and shall cause all its Subcontractors to maintain, records of the hours and wages of all employees employed on the Project, and those records shall be open at all times for inspection by the City and/or the Division of Labor Standards Enforcement of the Department of Industrial Relations, in accordance with Sections 1776 and 1812 of the Labor Code.

The Contractor shall not carry on its payrolls any person not actually employed by the Contractor, nor shall it carry on its payrolls employees of a Subcontractor. The Contractor shall show on its payrolls all persons actually employed by the Contractor on the Project, in any capacity. The Contractor shall supervise all Subcontractors to ensure that all Subcontractors comply with this Section.

The Contractor shall provide, and shall require all Subcontractors to provide, on a monthly basis, included with the progress payment request and the final payment request, verification of the actual wages paid to any or all employees on the Project, including but not limited to copies of timecards, payroll checks and stubs, job cost detail ledger for labor, evidence of payment of benefit contributions, and any other records necessary to establish compliance. The Contractor shall submit the monthly certified payrolls for all workers employed at the Site directly to the Owner's Representative with the monthly progress payment request. Failure to submit timely, complete certified payrolls or the other documents described in this section shall entitle the City to withhold



payment from the Contractor. Additionally, in the event of noncompliance with this section, the Contractor shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply. In the event of continued noncompliance, the penalties specified in subdivision (h) of the Labor Code section 1776 may be deducted from progress payments to the Contractor.

In accordance with Government Code Section 8546.7, or any amendments thereto, all books, records, and files of the Contractor, or any Subcontractor connected with the performance of this Contract, shall be subject to examination and audit by the Auditor General for a period of three (3) years after final payment. Contractor shall preserve and cause to be preserved such books, records and files for the audit period.

**D. Underpayment of Wages; Penalties.**

The Contractor agrees that in the event of underpayment of wages to any employee on the Project, whether by the Contractor or any Subcontractor, the City may retain from payments due to the Contractor, an amount sufficient to pay such worker the difference between the wages required to be paid by the DIR, and the wages actually paid such worker for the total number of hours worked. The City may disburse such retention to such employees.

In accordance with Articles 2 and 3, Chapter 1, Part 7, Division 2 of the Labor Code, particularly Sections 1775 and 1813, the Contractor shall forfeit to City as a penalty the sum specified below, over and above any retention or withholds otherwise authorized by the agreement, as follows:

1. Fifty dollars (\$50) for each calendar day, or portion thereof, for each worker paid less than the applicable prevailing wages for any work done under this Contract by him/her or any Subcontractor above him/her; and/or
2. Twenty-five dollars (\$25) for each worker employed in the execution of this agreement by the Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week and to whom applicable overtime rates have not been paid.

**E. Apprentices.**

Attention is directed to the provisions of Sections 1777.5, 1777.6 and 1777.7 of the Labor Code concerning the employment of apprentices by the Contractor or any Subcontractor under it.

The Contractor and all Subcontractors under it shall comply with the requirements of Section 1777.5 and Section 1777.6 in the employment of apprentices. Violation of these requirements shall subject the Contractor and/or Subcontractor to the penalties set forth in Section 1777.7 of the Labor Code and/or otherwise provided by law or Contract.

Information relative to apprentice standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex-officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices. Adequate supervision of all apprentices shall be maintained at all times by the Contractor and any Subcontractor employing the

apprentice.

F. Workers' Compensation.

Pursuant to Labor Code section 1860, in accordance with the provisions of Section 3700 of the Labor Code, the Contractor is required to secure the payment of workers' compensation to its employees. See also Article 3 of these General Provisions.

G. Compliance with State Anti-Discrimination Laws.

The Contractor shall comply with Section 1735 of the Labor Code, which provides as follows:

"No discrimination shall be made in the employment of persons upon public works because of the race, religious creed, color, national origin, ancestry, physical disability, mental disability, handicap, medical condition, marital status, or sex of such persons, except as provided in Section 12940 of the Government Code, and every contractor for public works violating this Section is subject to all the penalties imposed for a violation of [Chapter 1 of Part 7, Division 2 of the Labor Code]."

H. Fair Labor Standards.

The Contractor shall comply with the Fair Labor Standards Act of 1938 as amended (29 U.S.C. § 3201 et seq.) as applicable.

I. Contractors License.

The Contract shall comply, and cause its Subcontractors to comply, with the requirements of the California State Licensing Board and to have a valid contractor's license which is to be active as to the date of the receipt of bids and maintained in "Good Standing" from the receipt of bids throughout the Project.

J. Use of Pesticides.

The Contractor shall comply with all rules and regulations that govern the use of pesticides required in the performance of the Work, including any certifications that may be required for purchase, use, storage or application.

Pesticides include, but are not limited to, herbicides, insecticides, fungicides, rodenticides, germicides, nematocides, bactericides, inhibitors, fumigants, defoliants, desiccants, soil sterilants and repellants.

Any substance or mixture of substances intended for preventing, repelling, mitigating, or destroying weeds, insects, diseases, rodents or nematodes and any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant shall be considered a pesticide.

K. Reporting Requirements and Sanctions.

Failure to provide specific information, records, reports, certifications, or any other documents required for compliance with the Contract Documents will be considered noncompliance. The minimum documents required include the following:

1. List of Subcontractors: Required from the Contractor and each Subcontractor with a lower tier subcontractor; due within ten (10) Calendar Days after the date of the pre-construction conference or within ten (10) Calendar Days after

the date of award of the subcontract, whichever date is later.

2. **Certified Payroll Reports:** Required from the Contractor and each Subcontractor, regardless of the subcontract amount or the type of procurement, for every payroll period in which work is performed; due with each progress payment application and the final payment application.
3. **Fringe Benefit Statement:** Required from the Contractor and each Subcontractor if fringe benefits are paid to an approved plan, fund or program; due with first certified payroll report and any time the fringe benefit amounts change; not required if the fringe benefits are paid in cash to the employees.
4. **Other Documentation:** When required by the Special Provisions, other reporting documentation may be required depending on the funding for the project.

If the Contractor fails to comply with the reporting requirements of the Contract Documents, the Contractor will be advised of the specific deficiencies and requested to make immediate correction. The Contractor will be advised that payments will be withheld for failure to make corrections or cure delinquencies.

#### Section 6.02. Responsibility of the Contractor.

The Work shall be under the Contractor's responsible care and charge until completion and final acceptance, and the Contractor shall bear the entire risk of injury, loss, or damage to any part by any cause. The Contractor shall rebuild, repair, restore, and make good all injuries, losses or damage to any portion of the Work or the materials occasioned by any cause, and shall bear the entire expense.

The mention herein of any specific duty or responsibility imposed upon the Contractor shall not be construed as a limitation or restriction of any other responsibility or duty imposed upon the Contractor by the Contract, said reference being made herein merely for the purpose of explaining the specific duty or responsibility.

The Contractor shall do all of the work and furnish all labor, materials, tools, equipment, and appliances, except as otherwise herein expressly stipulated, necessary or proper for performing and completing the Work herein required, including any change order work or disputed work directed by the City in conformity with the true meaning and intent of the Contract Documents, within the time specified.

#### Section 6.03. Subcontracting.

If the Contractor subcontracts any work to be performed or materials to be supplied pursuant to this agreement, the Contractor shall be as fully responsible to the City for the acts and/or omissions of such Subcontractor or supplier and of the persons either directly or indirectly employed or engaged as Subcontractors by such Subcontractor or supplier as it is for its own acts and omissions.

The City and its representatives will deal only with the Contractor, and the Contractor shall be responsible for the proper execution of the Work. Any and all discussions between any

Subcontractor or supplier and the City or any of its representatives shall be initiated through the Contractor or its representative.

The Contractor shall bind every Subcontractor or supplier, and every subcontractor of a Subcontractor, by the terms of the Contract Documents. The Contractor shall include provisions in every Subcontract that the Contract between the Contractor and the City is part of the Subcontract, and that all terms and provisions of the Contract are incorporated in the Subcontract. Copies of all Subcontracts shall be available to the City upon written request.

Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor or supplier and the City or any of its representatives, nor shall this Contract be construed to be for the benefit of any Subcontractor or supplier.

The Contractor shall not perform work on the Project with a Subcontractor who is ineligible to perform work on public works project pursuant to Labor Code sections 1777.1 or 1777.7.

If, through acts or neglect on the part of the Contractor, including failure to supervise and control its Subcontractors or suppliers, any other contractor, Subcontractor or supplier, or worker suffers loss or damage, the Contractor agrees to settle with such other contractor, Subcontractor, supplier, or worker by agreement or arbitration, if such other contractor, Subcontractor, or worker shall assert any claim against the City or any of its officers, agents, or employees, on account of any damage alleged to have been so sustained.

In the event of the receipt of any such claim, the City shall notify the Contractor, who shall defend, indemnify, and save harmless the City and all of its officers, agents, and employees against any such claim.

#### Section 6.04. Listing of Subcontractors.

The Contractor shall comply with the requirements in the Instructions to Bidders regarding the listing of Subcontractors and shall comply with the requirements of the Subletting and Subcontracting Fair Practices Act, Chapter 4 of Part 1 of Division 2 of the Public Contract Code, commencing with Section 4100, forbidding bid shopping and bid peddling, requiring accurate listing of all Subcontractors, and requiring Subcontractors to be licensed.

Should the Contractor violate any of the provisions of this Section, the violation shall be deemed a breach of this contract and the City shall have all remedies provided by California law, including but not limited to those provided in Public Contract Code Section 4110, allowing termination of the Contract or a penalty assessment of ten percent (10%) of the subcontract amount.

#### Section 6.05. General Safety and Protection Requirements.

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work, for maintaining all safety and health conditions on the Site and for ensuring against and/or correcting any hazardous conditions on the Site. Also, in no case shall the City, the Owner's Representative, the Architect or Consulting Engineer, the Inspector, or their agents, employees or representatives, have either direct or indirect responsibility for the means, methods, techniques, sequences or procedures utilized by the Contractor, or for safety precautions and programs in connection with the Work, or for maintaining any safety or health conditions on the Site, or for ensuring against or correcting any hazardous conditions on the Site.

The Contractor shall comply with all Occupational Safety laws, rules and regulations applicable to the work.

A. Protection of Persons and Property.

The Contractor shall at all times, until final acceptance and payment hereunder, maintain adequate protection against injury to persons, including employees, or damage to property, on or near the Project, or adjacent to the Site. The Contractor shall be responsible for maintaining all safety and health conditions on the Site and for ensuring against and/or correcting any hazardous conditions on the Site. In no case shall the City, the City's Representative, the Architect, Consulting Engineer, Project Inspector or their agents, employees or representatives, have either direct or indirect responsibility for maintaining any safety or health conditions, or for ensuring against or correcting any hazardous conditions, on or near the Site, or adjacent to the Site.

The Contractor shall provide a safe environment for all functions to be performed by the Owner's Representative, Architect, Consulting Engineer and Project Inspector, and a safe place for all employees to work.

The use of alcohol or drugs will not be permitted on City property.

B. Protection and Repair of Work.

The Contractor shall protect the City's structures, facilities, equipment, tools, materials, and any other property on or adjacent to the Site against damage, loss, or theft by providing adequate security measures for its work. The Contractor shall, until final payment hereunder, maintain protection of all of its work and work performed by others under this Contract from damage, loss, defacement, or vandalism. The Contractor shall provide protection of completed work which may be subject to damage as a result of the Contractor's failure to perform as scheduled.

The Contractor shall repair or replace any damage and remove any damaged or defaced material and/or equipment from the Site at no cost to the City.

C. Protection of Workers.

The Contractor shall take every precaution for the safety of all employees and others on the Work, and to comply with all applicable provisions of federal, state and local safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the Work is being performed.

The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of workers and the public, and shall post danger signs warning against hazards created by construction including, but not limited to, protruding nails or reinforcing steel, hod hoists, elevator hatchways, scaffolding, window openings, stairways, and falling materials.

The Contractor shall immediately replace or repair any unsafe ladder, scaffolding, shoring, or bracing, or correct any other dangerous or hazardous situation that may exist.

The responsibility for maintaining a safe working site shall be the Contractor's, and the City, Owner's Representative, Architect, Consulting Engineer and Project Inspector undertake no obligation to suspend the work or notify the Contractor of any hazardous conditions or noncompliance with safety laws. In no case shall the City, the Owner's Representative, the Architect, Consulting Engineer, Project Inspector, or their agents, employees or representatives, have either direct or indirect responsibility for maintaining any safety or health conditions, or for ensuring against or correcting any hazardous conditions on the Site.

D, Working Limits and Regulations.

The Contractor shall confine its apparatus, storage and materials, and construction operations within the limits established by the Owner's Representative, and shall not unreasonably encumber the Site or adjacent areas with its materials and/or equipment.

The Contractor shall enforce any instructions from the City or the Owner's Representative regarding fires, placement of signs, danger signals, barricades, radios, noise and smoking.

E. Overloading.

The Contractor shall determine safe loading capacities and shall not overload any structure beyond its safe capacity during construction. In addition to assuming full responsibility for bodily injury and/or property damage resulting from any such overloading, the Contractor shall repair to the City's satisfaction or reimburse the City for the costs of repairing any damage resulting therefrom.

F. Protection of Existing Improvements.

The Contractor shall clean the portions of existing improvements and facilities which are used by, traversed or dirtied by the workers on the Work, normal maintenance due to use by City employees or the public excepted.

All existing improvements and facilities shall be protected from any damage resulting from the operations, equipment or workers of the Contractor during the course of the construction.

The Contractor shall take all necessary precautions to protect existing facilities against the effects of the elements and Contractor shall be strictly liable for failure to adequately protect any facility.

All damaged improvements and facilities shall be replaced, repaired, and restored to their original condition without additional cost to the City and without an extension of the Contract Time.

G. Security of the Site.

The Contractor is responsible for the security of the Site.

H. Removal of Barricades.

Upon completion of the work, the Contractor shall remove from the Site all materials used for barricades, temporary scaffolding, or any other temporary uses.



I. Protection of Adjacent Property; Notices.

In addition to any requirements imposed by law, the Contractor shall shore up, brace, underpin, and protect as may be necessary all foundations and other parts of all existing structures on the Site or adjacent to the Site which are in any way affected by the excavations or other operations connected with the completion of the Work.

Prior to excavation, the Contractor shall contact USA Underground Service Alert and shall obtain from them the location of underground utilities.

Prior to commencing any work which in any way affects adjoining or adjacent land or buildings thereon, or public utilities, the Contractor shall notify the Owner's Representative, who will send the City and occupants thereof a notice, which specifies the type of work to be done, the schedule of the work, the impacts expected from the work and the protective measures being taken by the Contractor. The notice shall also specify that any person receiving notice who has questions regarding it may contact the Owner's Representative.

Whenever any notice is required to be given to any adjoining or adjacent landowner, utility, governmental agency or other party before commencement of any work, the notice shall be given by the Contractor at least seven (7) days in advance of the work, or longer if required by law or regulation, with a copy delivered to the Owner's Representative.

The Contractor shall, at the written instruction of the Owner's Representative, meet with any recipient of such notice to explain and discuss the proposed work.

J. Fire Protection.

The Contractor shall take all steps necessary to protect all structures from fires and sparks originating from the Work, shall comply with all laws and regulations regarding fire protection, and shall comply with all instructions of the fire department with jurisdiction.

The Contractor shall notify the Owner's Representative and the fire department in writing at least seventy-two (72) hours prior to disconnection of either water or electrical service to the Site, and shall comply with the fire department's instructions regarding fire safety.

The Contractor must keep fire detection systems operational throughout the duration and scope of its work.

K. Repairs or Replacement.

Any damage to existing conditions, or to any other improvement or property above or below the surface of the ground, whether private or public, arising from performance of this Contract shall be repaired within forty-eight (48) hours by the Contractor without expense to the City, unless disruption of City operations or creation of a safety hazard has occurred, in which case damage will be corrected immediately.

If, in the opinion of the Architect or Consulting Engineer, the best interest of the City requires that repairs be made prior to the execution of any further work, the Owner's Representative will so notify the Contractor who shall delay or discontinue that part of the Work until the necessary repair has been made. Such delay shall be considered

non-compensable, and no extension of the Contract Time will be granted therefor.

Upon the failure of the Contractor to comply with any such order, or upon the Contractor's failure to make immediate emergency repairs which are necessary to protect the Work, the City shall do that work itself as is necessary to protect life and property, in its sole discretion, and deduct the total cost of such work from the next progress payment. No prior notice to the Contractor shall be necessary for the City to take this action.

L. Emergency Safety Actions.

In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without previous instructions or authorizations from the City, is authorized and shall act at its discretion and risk to prevent such threatened loss or injury, and the Contractor shall bear all costs of that action. The Contractor shall immediately notify the Owner's Representative of such actions, and thereafter shall comply with any instructions issued by the Owner's Representative.

Section 6.06. Asbestos Related Work.

All work involving asbestos containing material must be performed in accordance with California Labor Code, sections 6501.5 through 6510, inclusive, and California Administrative Code, Title 8, Section 5208 and all other pertinent laws, rules, regulations, codes, ordinances, decrees and orders.

Section 6.07. Air Pollution Control.

The Contractor shall comply with all air pollution control laws, statutes, rules, regulations and ordinances, including, without limitation, all County of Sacramento and City of Folsom air pollution control rules, regulations, and ordinances, which apply to any work performed pursuant to the Contract Documents.

Section 6.08. Water Pollution

The Contractor shall comply with all City of Folsom rules, regulations, ordinances and statutes which apply to water pollution, including Section 7-1.01G of the State Specifications and the City's NPDES permit requirements.

Unless provided by the City as part of the Contract Documents, within ten (10) Calendar Days of the Notice to Proceed, the Contractor shall prepare and submit to the City for approval a Storm Water Pollution Prevention Plan (SWPPP). The Contractor shall conduct all of its operations, and shall cause its Subcontractors and suppliers to conduct their operations, related to the Project so as to comply with the approved SWPPP. Failure to comply with the approved SWPPP shall subject the Contractor to a withholding of ten percent (10%) of each progress payment until the Contractor, Subcontractor or supplier is in compliance, in addition to any actual damages suffered by the City as a result of the noncompliance.

Section 6.09. Sound Control Requirements.

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the Contract Documents.

Each internal combustion engine, used for any purpose on the Project or related to the Project, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the Project without said muffler.



Section 6.10. Indemnification.

The Contractor shall defend, indemnify and save harmless the City, the Owner's Representative, the Architect, the Consulting Engineer and any of their respective officers, officials, agents, and employees from any and all claims, demands, damages, costs, expenses, attorney's fees, or liability arising out of or in any way connected with the performance or attempted performance of the provisions hereof, or in any way arising out of or connected with this Contract, including but not limited to, inverse condemnation, equitable relief, or any acts or omissions, any wrongful act, or any negligent act or omission to act, whether active or passive, on the part of the Contractor or any of its agents, employees, independent contractors, Subcontractors or suppliers; provided, further, without limiting the foregoing, that the indemnity is intended to apply to any wrongful acts, or any actively or passively negligent acts or omissions to act, committed jointly or concurrently by the Contractor, the Contractor's agents, employees, independent contractors, Subcontractors or suppliers, and the City, its agents, employees, or independent contractors.

The indemnity obligation expressly extends to and includes any and all claims, demands, damages, costs, expenses, or liability occasioned as a result of damages to adjacent property caused by the conduct of the Work.

The indemnity obligation expressly extends to and includes any and all claims, demands, damages, costs, expenses, or liability occasioned as a result of the violation by the Contractor, the Contractor's agents, employees, or independent contractors, Subcontractors or suppliers of any provisions of federal, state or local law, including applicable administrative regulations.

The indemnity obligation also expressly extends to and includes any claims, demands, damages, costs, expenses, or liability occasioned by injury to or death of any person, or any property damage to property owned by any person while on or about the Site or as a result of the Work, whether such persons are on or about the Site by right or not, whenever the Work is alleged to have been a contributing cause in any degree whatsoever.

Nothing contained in the foregoing indemnity provisions shall be construed to require the Contractor to indemnify the City in contravention of Section 2782 of the Civil Code for the sole negligence or willful misconduct of the City or its agents, employees or independent contractors.

In claims against any person or entity herein indemnified that are made by an employee of the Contractor or an employee of any of the Contractor's agents, independent contractors, Subcontractors or suppliers, a person indirectly employed by the Contractor or by any of the Contractor's agents, independent contractors, Subcontractors or suppliers, or anyone for whose acts the Contractor or any of the Contractor's agents, independent contractors, Subcontractors or suppliers may be liable, the indemnification obligation herein shall not be limited by any limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or the Contractor's agents, independent contractors, Subcontractors or suppliers under workers' compensation acts, disability acts, or other employee benefit acts.

The indemnification obligations herein shall not be limited by any assertion or finding that the person or entity indemnified is liable by reason of a non-delegable duty.

The indemnities set forth herein shall not be limited by the insurance requirements set forth in the Contract Documents.

The indemnification requirements herein set forth shall extend to claims occurring after this Contract is terminated as well as while it is in force.

Section 6.11. Indemnification of Adjacent Property Owners.

In the event the Contractor enters into any agreement with the owners of any adjacent property to enter upon or adjacent to such property for the purpose of performing this Contract, the Contractor shall fully indemnify, defend and save harmless such person, firm, or corporation, state or other governmental agency which owns or has any interest in the adjacent property. The form and content of the indemnification agreement shall be approved by the City prior to commencement of any work on or about such property. These provisions shall be in addition to any other requirements of the owners of adjacent property.

Section 6.12. Contractor's Legal Address; Written Notice.

Both the address given in the Bid and the Contractor's office in the vicinity of the Work are designated as places that samples, notices, letters or other articles or communications to the Contractor may be mailed or delivered. The delivery to either of these places shall be deemed sufficient service to the Contractor and the date of such service shall be the date of delivery. Written notice may be accomplished by personal delivery, United States mail, telegram, facsimile or any other form of commercially accepted communication. The written notice shall become effective upon delivery. Delivery is complete when the notice is hand-delivered to the Contractor's address given in the Bid or its job-site office; or when the facsimile transmission is complete; or two days after mailing by U.S. mail; or upon actual delivery as evidenced by a delivery receipt.

The address named in the Bid may be changed at any time by written notice from the Contractor to the City.

Nothing herein shall be deemed to preclude or render inoperative the service of any drawing, sample, notice, letter or other article or communication to the Contractor.

Section 6.13. Contractor Not Agent, Nor Employee.

Neither the Contractor nor any Subcontractor, or any officer, agent, or employee of either, is, nor shall they represent themselves to be, an agent, employee or other representative of the City for any purpose whatsoever.

No person employed by the Contractor, or by any Subcontractors, are, nor shall they be construed to be in any manner or for any purpose whatsoever, agents, employees or representatives of the City.

Nothing in the Contract Documents shall be construed to create any relationship of joint venture, partnership or other association of any nature whatsoever between the City and the Contractor other than that of owner and independent contractor. The City shall have the right to direct the Contractor as provided in the Contract Documents. The aforementioned right of supervision shall not reduce or abrogate the Contractor's liability for all damage or injury to persons, public property or private property that may arise directly or indirectly from the Contractor's execution of the Work.

Section 6.14. Conflict of Interest.

No official of the City who is authorized on behalf of the City to negotiate, make, accept, or approve, any architectural, engineering, inspection, construction, or materials supply contract, or any subcontract in connection with the construction of the Project, or any land acquisition in connection with the Project, shall become directly or indirectly interested personally in this Contract or in any part thereof.

No officer, employee, architect, attorney, engineer, or inspector of or for the City who is authorized on behalf of the City to exercise any executive, supervisory, or other similar function in connection with the construction of the Project shall become directly or indirectly interested personally in this contract or any part thereof.

Section 6.15. Third Party Claims.

The Contractor shall be responsible for all third party claims and costs or injuries incurred by a third party which result from the operations of the Contractor.

Section 6.16. Assignment of Contract.

The Contract or the performance of the Contract may be assigned by the Contractor, but only upon written consent of the City, which consent the City has the sole discretion to refuse for any reason whatsoever, and the consent of the Contractor's surety, unless the surety has waived its right of notice of assignment. No such assignment or subcontracting shall be permitted that would relieve the Contractor or the Contractor's surety of their responsibilities under the Contract Documents

Section 6.17. Assignment of Monies.

The Contractor may assign monies due the Contractor under the Contract, and such assignment will be recognized by the City, if given proper notice, to the extent permitted by law. Any assignment of monies shall be subject to all deductions provided for in the Contract Documents. Any money withheld may be used by the City for the completion of the Work if the Contractor defaults.

Section 6.18. Permits and Licenses.

The Contractor shall, at the Contractor's sole expense, obtain all necessary permits and licenses for the construction of the Work, give all necessary notices and pay all fees required by law relating to the Work. The Contractor shall also procure all permits and licenses necessary for the normal conduct of the Contractor's business and construction operations.

Unless otherwise noted in the Special Provisions, building, plumbing, heating, electrical and similar permits which the Contractor is required to obtain from the City Building Inspection Divisions for City owner projects are fee exempt and will be obtained by the City.

The California Environmental Quality Act of 1970 (CEQA) may be applicable to permits, licenses, and other authorizations that the Contractor shall obtain from local agencies in connection with performing the Work. The Contractor shall comply with the provisions of CEQA in obtaining such permits, licenses, and other authorizations, which will be obtained in time to prevent delays to the Work.

The Contractor shall comply with permits, licenses, or other authorizations applicable to the Work obtained by the City in conformance with the requirements in CEQA.

Section 6.19. Patents and Royalties.

All fees, claims, or royalties for any patented or copyrighted invention, article, arrangement, or plan that may be used upon or in any manner connected with the doing of the work or any part thereof shall be included in the price bid for doing the work. The Contractor and its sureties shall protect and hold harmless the City, Owner's Representative, Architect, Consulting Engineer and their consultants, Project Inspector, and each of their respective officers, agents, and employees against any and all demands made for such fees or claims and against any and all suits, demands, claims or causes of action brought or made by the holder of any invention, patent, copyright, or trademark, or arising from any alleged infringement of any invention, patent, copyright, or trademark.

Before final payment is made on account of this Contract, the Contractor shall furnish acceptable proof to the City of proper release from all such fees or claims.

Section 6.20. Approval of Contractor's Plans No Release from Liability.

The review or approval by the City of any working drawing or any method of work proposed by the Contractor shall not relieve the Contractor of any of the Contractor's responsibility for any errors and shall not be regarded as any assumption of risk or liability by the City or any officer, official, agent, employee, or representative of the City. The Contractor shall have no claim under the Contract because of the failure or partial failure or inefficiency of any reviewed or approved plan or method. City review or approval means that the City has no objection to the Contractor using the proposed plan or method at the Contractor's responsibility and risk.

Section 6.21. Providing and Paying for Materials.

Except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, products, articles, processes, labor, tools, equipment, and installation, and all associated superintendence of every nature whatsoever necessary to execute and complete the Work within the Contract Time.

Section 6.22. Warranty of Title.

No material, article, product, supplies, or equipment for the Work shall be subject to any chattel mortgage, or a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier.

The Contractor warrants good and sufficient title to all material, supplies, and equipment installed or incorporated in the Work, and agrees upon completion of the Work to deliver the premises, together with all improvements and appurtenances, constructed or placed thereon by the Contractor, to City, free from any claims, liens, or charges.

The Contractor agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by this Contract shall have any right to a lien upon the premises or any improvement or appurtenances thereon; provided, however, that nothing contained in this Section shall defeat or impair the rights of persons furnishing materials or labor under the payment bond given by the Contractor, nor any rights under any law permitting such persons to look to funds due to the Contractor but retained by the City.

The Contractor shall cause the provisions of this Section to be inserted in all subcontracts and material contracts executed by the Contractor and notice of this provision shall be given to all persons furnishing materials for the Work.

This Section shall not disallow the Contractor's installing any devices or equipment of utility companies or of governmental agencies, the title to which is commonly retained by the utility company or the agency.

Section 6.23. Rights and Remedies.

The duties and obligations of the Contractor imposed by the Contract Documents and the rights and remedies of the City available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

The failure of the City or its officials, officers, employees, agents, or of the Owner's Representative, the Project Inspector, Architect or Consulting Engineer to insist in any one or more instances upon the strict performance of any one or more of the provisions of this Contract or to exercise any right herein contained or provided by law, shall not be construed as a waiver or relinquishment of the performance of such provision or right(s) or of the right to subsequently demand such strict performance or exercise such right(s) and the rights shall continue unchanged and remain in full force and effect.

The Contractor agrees that it can be adequately compensated by money damages for any breach of this Contract which may be committed by the City or its officials, officers, employees, agents, or by the Owner's Representative, the Project Inspector, Architect or Consulting Engineer, and hereby agrees that no default, act or omission of the City or its officials, officers, employees, agents, or of the Owner's Representative, the Project Inspector, Architect or Consulting Engineer shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the provisions of the Contract or to suspend or abandon performance of all or any part of the Work. The Contractor hereby waives any and all rights and remedies to which it might otherwise be or become entitled, saving only its right to money damages.

Section 6.24. Guarantee Required.

In addition to any guarantees required elsewhere by the Contract Documents, the Contractor shall guarantee the Work for a minimum of two (2) years from and after the recordation of the Notice of Completion and completion of all contract obligations by the Contractor, including formal acceptance of the entire Project by the City. The Contractor specifically waives any right to claim or rely on the statutory definition of completion set forth in Civil Code section 3086. The Contractor specifically acknowledges and agrees that completion shall mean the Contractor's complete performance of all Work required by the Contract Documents, amendments, change orders, construction change directives and punch lists, and the City's formal acceptance of the entire Project, without regard to prior occupancy, substantial completion doctrine, beneficial occupancy, or otherwise. Such guarantee shall be made on the form provided by the City.

The guarantee period for corrected defective work shall continue for a duration equivalent to the original guarantee period.

Such guarantee is in addition to, and not in lieu of, the City's rights to enforce this Contract in all respects.

Section 6.25. Anti-Trust Assignment.

By execution of the Contract Documents, or any subcontract awarded by the Contractor, the Contractor or any Subcontractor offers and agrees to assign and hereby does assign to the City all rights, title, and interest in and to all causes of action the Contractor or Subcontractor may have under Section 4 of the Clayton Act (15 USC Section 15) or under the Cartwright Act

(Chapter 2 of Part 2 of Division 7 of the Business and Professions Code, commencing with Section 16700), arising from purchases of goods, services, or materials pursuant to this public works contract or subcontract. This assignment shall be made and shall become effective at the time the City tenders final payment to the Contractor, without further acknowledgment by the parties.

Section 6.26. Access to Records.

The City or the City's authorized representative shall have access, upon reasonable notice, during normal business hours, to any books, documents, accounting records, papers, project correspondence, project files, scheduling information and other relevant records of the Contractor and all Subcontractors directly or indirectly pertinent to the Work, original as well as change and claimed extra work, to verify and evaluate the accuracy of cost and pricing data submitted with any change order prospective or executed, or any claim for which additional compensation has been requested.

Such books, documents and other records mentioned above shall include, but are not limited to all those reasonably necessary in the opinion of the City to determine the accurate amount of direct and indirect costs, job site, area and home office overhead, delay and impact costs, however characterized, and shall include the original bid and all documents related to the bid and its preparation, as well as the as-planned Contract Schedule and all related documents.

Such access shall include the right to examine and audit such records, and make excerpts, transcriptions and photocopies at the City's cost.

Section 6.27. Liability of City.

Neither the City, nor any of its officers, agents, employees or representatives shall be responsible for any liability arising under this Contract, except such obligations as are specifically set forth herein.

Section 6.28. No Verbal Agreements.

No verbal agreement or conversation with any officer, agent, or employee of the City, either before, during, or after the execution of the Contract Documents shall affect or modify any term or condition contained in the Contract Documents, nor shall such verbal agreement or conversation entitle the Contractor to any additional payment or time to perform whatsoever under the terms of this agreement.

Section 6.29. Unenforceability of any Clause.

If any clause or provision of the Contract Documents is held to be unenforceable or invalid, then that provision of the Contract shall be stricken and the remaining portion shall remain in full force and effect.



## ARTICLE 7. PROSECUTION OF THE WORK

### Section 7.01. Beginning Work

The return of the executed contract, together with the prescribed bonds and certification of insurance, and when required, advance on incidental expenses and acquisitions, shall constitute authority for the Contractor to enter upon the Project Site and to begin operations. Should the Contractor start work in advance of receiving notice that the Contract has been executed by the City, any work performed by the Contractor shall be at the Contractor's own risk.

The pre-construction conference must be conducted before any work shall commence.

Should the Contractor desire to begin work prior to the execution of the Contract, the Contractor shall furnish to the City insurance certificates covering said operations in the type and amount set forth in the Contract Documents.

The Contractor shall give the City at least five (5) Working Days' notice of its intention to start work, specifying the time, date and location at which the Contractor intends to begin.

The counting of Working or Calendar Days shall begin ten (10) Calendar Days from the date the Contractor receives the Notice to Proceed. The Notice to Proceed will be sent by certified mail or hand delivered to the Contractor. In no event shall there be a period of time greater than thirty (30) Calendar Days from the time the Contract forms are first received by the Contractor and the commencement of the Contract Time, regardless of the receipt or lack thereof of signed documents or completion or lack thereof of provisions regarding required bonds and certificates.

When the Contractor has started work on the Project, the Contractor shall diligently prosecute the work to completion within the time limit provided in the Contract Documents.

### Section 7.02. Pre-Construction Conference and Progress Meetings.

Prior to beginning work a pre-construction conference shall be held for the purpose of reviewing the Work. The Contractor must attend this pre-construction conference, and shall invite Subcontractors and others necessary to ensure all topics are adequately covered. Topics discussed include, but are not limited to, mobilization, access, temporary facilities, utilities, Subcontractors, schedules, procedures, correspondence, progress payments, payroll records, storm water pollution prevention plans (SWPPP), coordination, safety, after-hour contacts for Contractor and City personnel, quality control/quality assurance, personnel assignments, and other topics as appropriate.

Progress meetings, as stipulated in the Special Provisions or as required by the City, will be conducted throughout the duration of the Contract. The purpose of these meetings is to inform, discuss, and resolve issues related to the Work; the Contractor or the Contractor's agent shall attend. Topics discussed include, but are not limited to, progress, schedules, safety, SWPPP, Requests for Information, Change Orders, Field Instructions, field coordination, Submittals, quality control/quality assurance, testing, startup, safety, and other topics related to the Work.

### Section 7.03. Initial Contract Schedule.

No later than seven (7) Calendar Days after receiving Notice to Proceed, the Contractor shall furnish to the Owner's Representative one hard copy and one copy in electronic format (CD or 3-1/2" Windows-format floppy disk) of an Initial Contract Schedule.

The Initial Contract Schedule shall be based on and incorporate the Contract Milestone and Completion Dates specified in the Contract Documents.

The Initial Contract Schedule shall indicate the detailed plan for the work to be completed in the first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; and procurement of materials and equipment. Work beyond ninety (90) days shall be shown in summary form.

A. The Initial Contract Schedule shall be a time-scaled Critical Path Method (CPM) type schedule, prepared in Microsoft Project or Primavera software, or equal software subject to City acceptance.

B. Overall time of completion and time of completion for each milestone shown on the Initial Contract Schedule shall adhere to the times in the Special Provisions, unless an earlier (advanced) initial time of completion is requested by Contractor and agreed to by the Owner's Representative. Any such agreement shall be formalized by a Change Order.

The Owner's Representative will review the Initial Contract Schedule for conformance with the requirements of the Contract and will return the Initial Contract Schedule with comments within seven (7) Calendar Days after receiving it from Contractor.

#### Section 7.04. Contract Schedule Development.

Within 21 Calendar Days after receiving the Notice to Proceed, the Contractor shall submit a detailed Proposed Contract Schedule presenting an orderly and realistic plan for completion of the Work, in conformance with the requirements of this specification. The Proposed Contract Schedule shall be in hard copy and electronic format (CD or 3-1/2" Windows-format floppy disk).

The Contract Schedule shall furnish or comply with the following requirements:

A. A time scaled CPM type schedule, prepared in Microsoft Project or Primavera software, or equal software subject to City acceptance.

B. No activity on the schedule shall have a duration longer than fourteen (14) Working Days, with the exception of fabrication and procurement activities, unless otherwise approved by the City. Activity durations shall be the total number of actual days required to perform that activity including consideration of weather impact on completion of that activity.

C. Procurement of major equipment, through receipt and inspection at the job site, identified as a separate activity.

D. Owner furnished materials and equipment if any, identified as separate activities.

E. Dependencies (or relationships) between activities.

F. Processing/approval of submittals and shop drawings for major equipment. Activities that are dependent on submittal acceptance and/or material delivery shall not be scheduled to start earlier than the expected acceptance or delivery dates.

G. Separate buildings and other independent project elements shall be individually



identified in the network.

H. Fourteen (14) Working Days for developing punch list(s), completion of punch list items, and final clean up for the work or any designated portion thereof. No other activities shall be scheduled during this period.

I. Interface with the work of other Contractors (or entities).

Each activity shown on the Contract Schedule shall have the following minimum information:

- Unique number(s) for each activity
- Activity description
- Activity relationships and dependencies (logic)
- Activity duration in Working Days
- Early start, early finish, late start, late finish dates (calendar date, i.e., day, month, year)
- Total float, free float
- For completed activities: actual start dates, actual finish dates, duration, and logic
- Interim milestone dates and completion dates
- Detailed list of work contained within each activity
- Manpower loading for each item of work for unit price contracts
- Cost loading for each item of work for lump sum contracts

The Owner's Representative will review the Proposed Contract Schedule for conformance with the requirements of the Contract and, within seven (7) Calendar Days after receipt, will approve the Contract Schedule or will return it with comments. If the Proposed Contract Schedule is not approved, the Contractor shall revise the schedule to incorporate comments and resubmit the schedule for approval within seven (7) Calendar Days after receiving it. The approved schedule shall become the Contract Schedule.

The Contract Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. The responsibility for developing the Contract Schedule and monitoring actual progress as compared to the schedule rests with the Contractor.

Failure of the Contract Schedule to include any element of the work or any inaccuracy in the Contract Schedule will not relieve Contractor from responsibility for accomplishing all the Work in accordance with the Contract.

Approval of the Contract Schedule will not relieve the Contractor of the responsibility for accomplishing the Work in accordance with the Contract and the Contract Time.

Failure to obtain the approved Contract Schedule within forty (40) Calendar Days of the Notice to Proceed may result in the City withholding each progress payment until an approved Contract Schedule is obtained.

#### Section 7.05. Monthly Updates.

Contractor shall submit to the Owner's Representative each month with its payment application an electronic and hard copy up-to-date status report of the Work. The status report shall include:

A. Contractor's estimated percentage complete and remaining duration for each activity

not yet complete.

B. Actual start/finish dates for activities as appropriate.

C. Identification of processing errors, if any on the previous update reports.

D. Revisions, if any, to the assumed activity durations including revisions for weather impact for any activities due to the effect of the previous update on the schedule.

E. Identification of activities that are affected by requested or proposed changes to the Work.

F. Resolution of conflict between actual work progress and schedule logic. When out of sequence activities develop in the Contract Schedule because of actual construction progress, the Contractor shall submit revisions to schedule logic to conform to current status and direction.

The Owner's Representative will review the updated information and meet with Contractor each month at the Site to determine the status of the Work. If agreement cannot be reached on any issue, the Contractor will use the Owner's Representative's determination in the processing of the update.

Progress payments pursuant to the Contract will be based on the update of the Contract Schedule. No progress payments will be made without the required monthly update of the Contract Schedule.

#### Section 7.06. Schedule Revisions.

If the sequence of construction differs significantly, as determined by the Owner's Representative, from the Contract Schedule, Contractor shall submit within fifteen (15) Calendar Days a revised schedule to the Owner's Representative for approval.

When a requested or proposed change to the Work will have an impact on the critical path, the Contractor shall submit a schedule fragnet showing this impact. If the requested or proposed change is accepted by the City, the schedule fragnet shall be incorporated into the Contract Schedule. Time extensions will be considered only to the extent there is insufficient remaining float to accommodate these changes, and pursuant to this Article 7 of these General Conditions. No additional cost beyond that provided in Article 9 will be allowed for the incorporation of approved changes into the Contract Schedule. Should the Contractor, after approval of the Contract Schedule, intend to change its plan of construction, it shall submit its requested revisions to the Owner's Representative, along with a written statement of the revision, including a description of the logic for rescheduling the work, methods of maintaining adherence to Intermediate milestones and other specific dates and the reasons for the revisions. If the requested changes are acceptable to the Owner's Representative, they will be incorporated into the Contract Schedule in the next reporting period.

Schedule revisions shall be submitted at least seven (7) Calendar Days prior to the date of submission of update information. The City will have seven (7) Calendar Days to review the revisions.

Section 7.07. Short Interval Schedules.

Contractor shall prepare a Short Interval Schedule (SIS) to be used throughout the duration of Work. The SIS shall include all current activities and projected activities for the succeeding two (2) weeks. The SIS shall include actual start/finish dates for the preceding one (1) week. The SIS shall be submitted to the Owner's Representative prior to the weekly construction meeting. The Contractor shall participate in short interval scheduling coordination during the weekly construction meetings.

Section 7.08. Owner's Right to Revise Schedule.

In the event of a delay affecting the occupancy date of the Project and not the fault of the Contractor, the Owner's Representative may elect to resequence work or otherwise modify the schedule in an attempt to maintain the Date of Completion. It shall be the responsibility of the Contractor to cooperate in this effort. It is not the City's responsibility to ensure the Contractor the ability to use "optimal" crew size throughout the Project and no adjustment of the Contract Sum will be made for minor variations in crew size or claimed loss of efficiency or disruption that result from schedule adjustments. However, overtime work or weekend work required by the Owner's Representative to meet schedule objectives other than those of the individual contractor will be reimbursed per the provisions of Article 9, provided that Contractor has not contributed to the delay which the Owner's Representative is seeking to overcome. If the Contractor contends that a schedule adjustment will cause a significant disruption of its work sequence or ability to perform work efficiently, it shall notify the Owner's Representative within forty-eight (48) hours of receipt of the adjustment. Failure to provide timely notice constitutes a waiver by Contractor of any claim for compensation arising out of the schedule adjustment.

Section 7.09. Time of Essence.

Time is of the essence of this agreement. The Contractor shall, to the fullest extent possible, carry on the various classes or parts of the Work concurrently, and shall not defer construction of any portion of the Work in favor of any other portion of the Work, without the express approval of the Owner's Representative.

Section 7.10. Date of Completion.

The Contractor shall fully and satisfactorily complete the Work within the Contract Time. The Date of Completion is defined in Article I.

Section 7.11. No Right to Early Completion.

Any intent or plan on the part of the Contractor to complete the Work earlier than the Contract Time shall be at the Contractor's sole risk. Absent a Change Order signed by the City, the Contractor shall not be entitled to any additional compensation of any kind, including, without limitation, extended overhead, based on a claim that it intended to complete the Work earlier than the Contract Time but that it was unable to so complete early, regardless of the cause of the Contractor's failure to complete the Work earlier than the Contract Time.

Section 7.12. Responsibility for Completion.

The Contractor shall furnish sufficient manpower, materials, facilities and equipment and shall work sufficient hours, including night shifts, overtime operations, Sundays and holidays as may be necessary to insure the prosecution and completion of the Work in accordance with the Contract Time. If work on the critical path is seven (7) days or more behind the currently updated Contract Schedule and it becomes apparent that the Work will not be completed within the Contract Time, the Contractor will implement whatever steps it deems necessary to make up all lost time at no additional cost to the City. If the Contractor's solution is not successful, it will

make further attempts using the following sequence of events:

- A. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.
- B. If the above cannot be achieved then;
  - 1. The Contractor shall increase manpower in such quantities and crafts as will substantially eliminate, in the judgment of the City, the backlog of work; or increase the number of working hours, shifts per working day, working days per week or the amount of equipment or any combination of the foregoing sufficiently to substantially eliminate in the judgment of the City the backlog of work.
  - 2. In addition, the City may require the Contractor to submit a recovery schedule demonstrating its program and proposed plan to make up a lag in scheduled progress and to ensure completion of the Work within the Contract Time. If the City finds the proposed recovery schedule unacceptable, it may require the Contractor to submit a new plan. If the actions taken by the Contractor or the second plan proposed are unsatisfactory, the City may require the Contractor to take any of the actions set forth in the previous paragraph without additional cost to the City to make up the lag in scheduled progress.

Failure of the Contractor to comply with the requirements of this Section shall be considered grounds for a determination by the City, pursuant to Article 5, Section 5.25, that the Contractor is failing to prosecute the Work with such diligence as will ensure its completion within the time specified.

Section 7.13. Daily Reports.

The Contractor shall submit a Daily Activity Report to the Owner's Representative for each workday including weekends and holidays, when worked. The Daily Activity Report shall indicate, at a minimum, the Subcontractors on Site, the number of people on site for each trade, the weather conditions, the number of hours worked, the activities performed, any problems encountered, and any other information relevant to the work performed on each day.

Section 7.14. Payments Withheld.

Progress Payments may be withheld in whole or in part should the Contractor fail to comply with the requirements of this Article.

Section 7.15. Extensions of Time; Unavoidable Delays.

The Contractor shall not be granted an extension of time except on the issuance of a Change Order by the City, upon a finding of good cause for such extension.

- A. As used herein, the following terms shall have the following meanings:

- 1. "Excusable Delay" means any delay in completion of the Work beyond the expiration of the Contract Time caused by conditions beyond the control and without the fault or negligence of the Contractor. These events may include strikes, embargoes, fire, unavoidable casualties, national emergency, and stormy and inclement weather conditions in which the Owner's Representative and Project Inspector agree that work on the critical path cannot continue. The financial inability of the Contractor or any

Subcontractor or supplier and any default of any Subcontractor, without limitation, shall not be deemed conditions beyond the Contractor's control. An Excusable Delay may entitle the Contractor to an extension of the Contract Time, in accordance with this Section, but shall not entitle the Contractor to any adjustment of the Contract Sum.

2. "Compensable Delay" means any delay in the completion of the Work beyond the expiration date of the Contract Time caused solely by the wrongful acts of the City and which delay is unreasonable under the circumstances and not within the contemplation of the parties. A Compensable Delay may entitle the Contractor to an extension of the Contract Time, in accordance with this Section and/or an adjustment of the Contract Sum. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay, interruption, hindrance, or disruption.
3. "Inexcusable Delay" means any delay in completion of the Work beyond the expiration of the Contract Time resulting from causes other than those listed in Subparagraphs A1 and A2, above. An Inexcusable Delay will not entitle the Contractor to an extension of the Contract Time or an adjustment of the Contract Sum.

B. The Contractor may make a claim for an extension of the Contract Time, for an Excusable Delay or a Compensable Delay, subject to the following:

1. If an Excusable Delay and a Compensable Delay occur concurrently, the maximum extension of the Contract Time shall be the number of days from the commencement of the first delay to the cessation of the delay which ends last. Any adjustment of the Contract Sum shall be in accordance with Article 9 and shall be based only on the non-concurrent portion of any Compensable Delay.
2. If an Inexcusable Delay occurs concurrently with either an Excusable Delay and/or a Compensable Delay, the maximum extension of the Contract Time shall be the number of days, if any, by which the duration of the Excusable Delay and/or the Compensable Delay calculated in accordance with subparagraph B1, if applicable, exceeds the Inexcusable Delay. The duration of the concurrence is non-compensable.

Delays in the prosecution of parts or classes of the Work which do not prevent or delay the completion of the whole Work within the Contract Time are not to be considered Excusable or Compensable.

Float or slack time is the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of activities on the Contract Schedule. No time extensions or delay costs will be allowed for delays caused by the City on paths of activities containing float, providing such delay does not exceed the float time per the latest updated version of the approved Contract Schedule.

Whenever the Contractor foresees any delay in the prosecution of the Work, and in any event immediately upon the occurrence of any delay which the Contractor regards as good cause for an extension, the Contractor shall notify the Owner's Representative in writing of the delay. The notice shall specify with detail the cause asserted by the Contractor to constitute good cause for an extension together with a detailed schedule analysis showing the effect of the delay on the critical path of the Contract Schedule and a quantification of the length of the requested

extension of time. Failure of the Contractor to submit such a notice within seven (7) Calendar Days after the initial occurrence of the event giving rise to the delay shall constitute a waiver by the Contractor of any request for extension, and no extension shall be granted as a consequence of such delay.

The City shall have no obligation to consider any time extension request unless the Contractor has complied with the requirements of the Contract Documents, including, without limitation, giving the required seven (7) days' notice and submitting the detailed supporting schedule analysis. The City shall not be responsible or liable to the Contractor for any constructive acceleration due to failure of the City to grant time extensions under the Contract Documents, should the Contractor fail to comply with the submission and justification requirements of the Contract Documents for time extension requests. The Contractor's failure to perform in accordance with the Contract Schedule shall not be excused because the Contractor has submitted time extension requests, unless and until such requests are approved by the City.

Upon receipt of a request for extension, the Owner's Representative shall conduct an investigation of the facts asserted by the Contractor to constitute good cause for an extension. The Owner's Representative shall report the results of this investigation, as well as the propriety of the time extension requested, to the Contractor in writing within ten (10) Calendar Days of receipt of the request and shall indicate whether it will recommend for or against the extension. Upon receiving the Owner's Representative's recommendation, the Contractor may either concur in the recommendation, or reject the recommendation and proceed with a notice of potential claim and claim as provided for in Article 9.

#### Section 7.16. Discretionary Time Extensions for Best Interest of the City.

The City reserves the right to extend the time for completion of the Work if the City determines that such extension is in the best interest of the City. In the event that a discretionary extension is granted at the request of the Contractor, the City shall have the right to charge to the Contractor all or any part, as the City may deem proper, of the actual cost of construction management, engineering, inspection, supervision, incidental and other overhead expenses that accrue during the period of the extension, and to deduct all or any portion of that amount from the final payment for the Work.

In the event a discretionary time extension is ordered over the objection of the Contractor, and the decision rests solely with the City and is not legally compelled for any cause, the Contractor shall be entitled to a contract change pursuant to Article 9 adjusting the price paid to reflect the actual costs incurred by the Contractor as a direct result of the delay, upon its written application therefor, accompanied with such verification of costs as the Owner's Representative requires. The decision of the City on any discretionary time extension and the costs thereof shall be final and binding.

#### Section 7.17. Temporary Suspension or Delay of Work.

The City has the authority to suspend or delay the Work, wholly or in part, for any period the City deems necessary. The Contractor shall immediately comply with the City's written order to suspend or delay the Work. The suspended or delayed work shall be resumed only when conditions are favorable or methods are corrected, as ordered or approved in writing by the City. Public safety and convenience must be maintained throughout the suspension or delay in accordance with the Contract Documents.

Delays due to suspension of work shall be classified as Excusable or Inexcusable Delays. Such suspension shall not relieve the Contractor of the Contractor's responsibilities as described in



the Contract Documents.

Section 7.18. Suspensions Exceeding One Year.

Should the Work be suspended for a period exceeding one calendar year due to war conditions, labor conditions, legal actions, or for other conditions constituting the legal defense of impossibility of performance, the Contractor and City agree to enter into an agreement terminating the agreement upon the following terms and conditions.

The City shall be responsible only to pay the Contractor the actual value of the work performed from the Date of Commencement or from the date of the last progress payment, whichever is later, plus the ten percent (10%) retention from prior progress payments, less any deductions authorized by the Contract Documents.

As between the Contractor and the City, it shall be conclusively presumed that the actual value for the Contractor's work to the date of the last progress payment is no more than the actual amount of prior progress payment plus the ten percent (10%) retention from those progress payments; provided, however, that this Section shall not preclude the City from deducting charges for work or materials which do not meet the requirements of the Contract Documents.

Section 7.19. Liquidated Damages.

If the Work is not completed by the Contractor in the time specified in the Contract Documents, or within any period of extension authorized pursuant to this Article, the Contractor acknowledges and admits that the City will suffer damage, and that it is impracticable and infeasible to fix the amount of actual damages. Therefore, it is agreed by and between the Contractor and the City that the Contractor shall pay to the City as fixed and liquidated damages, and not as a penalty, the sum specified in the Contract Documents for each Calendar Day of delay until the Date of Completion, and that both the Contractor and the Contractor's surety shall be liable for the total amount thereof, and that the City may deduct Liquidated Damages from any monies due or that may become due to the Contractor. If it appears during the course of construction that the Contractor is behind schedule and the imposition of liquidated damages is likely, or if liquidated damages begin to accrue prior to the time for final payment, the amount accrued shall be withheld from any progress payment that would otherwise be due. This right to withhold funds is intended to complement the City's other rights under the Contract Documents.

This liquidated damages provision shall apply to all delays of any nature whatsoever, save and except only delays found to be excusable or compensable pursuant to this Article, or time extensions granted by the City.

Pursuant to Government Code Section 4215, the Contractor shall not pay fixed and liquidated damages for delay in completing the project caused by the failure of the City or the owner of utility facilities located on the Project Site to provide for removal or relocation of such facilities.

Payment by the City of any progress payments after expiration of the Contract Time shall not constitute a waiver by the City of its right to claim liquidated damages in accordance with this Section.

If the Contract is terminated after the Contract Time, as adjusted by any extensions of time that the City may have granted, the Contractor shall remain liable to the City for liquidated damages for all periods of time from such termination date until the Date of Completion.

Section 7.20. Extension of Time Not a Waiver.

Any extension of time granted the Contractor pursuant to this Article shall not constitute a waiver by the City of, nor a release of the Contractor from the Contractor's obligation to perform this Contract in the Contract Time, as modified by the particular extension in question.

The City's decision to grant a time extension due to one circumstance set forth in one request, shall not be construed as a grant of an extension for any other circumstance or the same circumstance occurring at some other time, and shall not be viewed by the Contractor as a precedent for any other request for extension.

Section 7.21. Pursuance of Work During Inclement Weather.

During inclement or unsuitable weather or other unfavorable conditions, the Contractor shall pursue only such portions of the Work that will not be damaged by the weather or unfavorable conditions. When the weather or unfavorable conditions create hazardous travel or working conditions, as determined by the City, the Contractor may be directed to stop that portion of the Work, in accordance with Section 7.17 until the weather clears or the conditions are no longer unfavorable.

The Contractor must keep roads safe and inspect and maintain storm water pollution prevention and erosion control devices during inclement weather or unfavorable conditions. Lane and road closures may not be allowed if the City determines that the traffic controls will create unnecessary risk to the traveling public, the Contractor, and/or City employees.

Section 7.22. Effect of Stop Work Notice.

If the City orders a suspension of the Work pursuant to Article 5, Section 5.19, the days on which the suspension is in effect shall be included in determining the required completion date, and shall not otherwise modify or extend the time within which the Contractor is to perform. In such event, the Contractor shall not be entitled to any damages or compensation on account of such suspension or delay, unless the Contractor can establish that stop work notice was not warranted.

Section 7.23. Weekend, Holiday and Night Work.

No work shall be done between the hours of 6:00 p.m. and 7:00 a.m., or on Sundays or legal holidays except with written permission of the City. Request to work between 6:00 p.m. and 7:00 a.m. or on Sundays or legal holidays must be submitted in writing to the Owner's Representative at least two (2) Working Days in advance of the intended work. In case of an emergency the Contractor will be allowed to work at night or on Sundays or legal holidays, but must notify the Owner's Representative immediately. An emergency shall be considered an unforeseen event that poses a danger to the public or to the uncompleted work.

It is understood that two (2) or three (3) shift operations may be established as a regular procedure by the Contractor upon written permission from the City. Such permission may be revoked if the Contractor fails to maintain adequate force and equipment for reasonable prosecution and inspection of the Work, or fails to provide sufficient artificial light to permit the Work to be carried out safely and appropriately and to permit inspection.

The Contractor shall give the Owner's Representative one (1) Working Day prior written notice of any work to be done on a Saturday, with the location and type of work to be done specified. Any work done without such notice and without the supervision of an inspector may be ordered



removed and replaced at the Contractor's expense.

Section 7.24. Use of Completed Portions.

The City has the right during the progress of the Work to take over and place in service any completed or partially completed portion of the Work. Taking possession shall not be deemed acceptance of any other portions of the Work, nor of any work on those portions not completed in accordance with the Contract.

Prior to the Date of Completion, the Contractor shall make all repairs or renewals in the portion of the Work occupied by the City made necessary due to defective material or workmanship, or the operations of the Contractor, ordinary wear and tear excepted.

Section 7.25. Coordination with Other Activities.

The Contractor shall conduct its operations so as not to interfere unreasonably with the City's use of the occupied portions of the Site. The Contractor shall submit periodic schedules to the Owner's Representative proposing the times, areas, and types of work to be done within such areas.

If the Work produces conditions rendering the occupied portions of building, the Site, or other areas uninhabitable, either because of noise, dust, vibration, smoke, fumes, or for any other cause whatsoever, the Owner's Representative may suspend the Work or direct the Contractor to modify the Contract Schedule, and the Contractor shall comply.

Except as provided by Change Order, the Contractor shall not be entitled to a time extension or increase in the Contract Sum by virtue of conflicts between the Contractor's work and the City's occupancy.

Section 7.26. Periodic Cleaning of Project.

The Contractor shall properly clean its work and the Site, and maintain its work area in an orderly manner. The Contractor shall remove all dirt, debris, waste, rubbish, and implements of service from the Project, the adjacent sidewalks and streets, and the working area daily or as directed by the Owner's Representative. Debris, waste, or unused construction materials shall not be left under, in, or about the Project, nor allowed to accumulate on the Site or in the working area.

The Contractor, at its sole cost, shall contract with a disposal company to remove all rubbish, and shall have the refuse containers emptied at frequent enough intervals so that waste does not overflow the containers.

If the Contractor fails to clean up during progress or upon completion of the Work, the City may do so at the Contractor's expense.

Section 7.27. Final Cleaning of Project.

At completion of the Work and prior to final acceptance/inspection and occupancy by the City, the Contractor shall thoroughly clean the interior and exterior of the buildings, and the Site and adjacent areas, of all material related to its performance of the Work. In the event the Contractor fails to do so, the City may cause this work to be done at the Contractor's expense.

Prior to final completion or City occupancy, the Contractor shall conduct an inspection of sight-exposed surfaces, and all work areas, to verify that the entire work is clean. In the event the Contractor fails to do so, the City may cause this work to be done at the Contractor's expense.

Section 7.28. Notice of Punch List Inspection.

When the Contractor believes that a phase of its Work is complete, it shall request in writing a punch list inspection. Within five (5) Working Days of the receipt of such request, the Owner's Representative, the Project Inspector and the Architect or Consulting Engineer shall make a punch list inspection or inform the Contractor that the work is not ready for punch list inspection; upon completion of the deficient work, the Contractor shall again request a punch list inspection. The Contractor or its representatives shall be present at the punch list inspection. The purpose of the punch list inspection is to determine whether the Work has been completed in accordance with the Contract Documents, including all Change Orders, all interpretations and instructions previously issued.

If the Contractor requests a punch list inspection when the Work is not ready for the inspection, the Contractor shall pay all costs associated with the inspection.

If Contractor fails to attend any punch list inspection, the Contractor shall be charged for the cost of the Owner's Representative, the Project Inspector, Architect or Consulting Engineer, and other design professionals who attended the punch list inspection.

Completion of any phase of the Work does not result in final completion, or in any way alter the payment provisions after final completion.

Section 7.29. Punch List.

The Owner's Representative, the Project Inspector and the Architect or Consulting Engineer shall notify the Contractor in writing of any deficiencies to be remedied prior to final acceptance, by preparing a written list, known in the industry as a punch list. The Contractor shall remedy all items shown on the punch list prior to final acceptance by the City.

No one is authorized to amend the Contract Documents by use of the punch list; it is provided solely for the benefit of the Contractor to enable it to determine what items must be corrected before final acceptance will be recommended by the Owner's Representative, the Project Inspector and the Architect or Consulting Engineer. The City reserves the right to require compliance with the Contract Documents, notwithstanding the issuance of a punch list or the completion by the Contractor of all items on the punch list.

In the event that the Work still does not comply with the Contract Documents, the City reserves the right to issue such further punch lists as may be required, or to deduct from the final payment the cost of correcting any work not completed in accordance with the Contract Documents, but accepted by the City, without the issuance of further punch lists.

If punch list work needs to be performed after the City has taken occupancy of any portion of the Work, the work shall be conducted at the direction of the Owner's Representative.

Section 7.30. Completion; Acceptance of Contract; Notice of Completion.

The Contractor acknowledges and agrees that completion for purpose of final payment shall mean the Contractor's complete performance of all Work required by the Contract Documents, amendments, Change Orders, Construction Change Directives and punch lists, and the City's formal acceptance of the Work, without regard to prior occupancy, substantial completion doctrine, beneficial occupancy or otherwise.

Acceptance of the Work shall be made only by formal written acceptance by the City. Recordation of a Notice of Completion shall be in the manner prescribed by law, provided that the Work shall then be fully and satisfactorily completed and the provisions of the Contract Documents fully and satisfactorily performed in all respects.

## ARTICLE 8. MEASUREMENT AND PAYMENT

### Section 8.01. Schedule of Values.

Within ten (10) days after Notice to Proceed, the Contractor shall submit to the City a schedule of values broken down by phase in sufficient detail to evaluate progress at any point in the Work. In no event shall an individual line item on a schedule of values exceed five percent of the Contract Sum unless so approved in advance by the Owner's Representative. Labor, material, and subcontract costs shall be shown separately. Cost of contract closeout shall be shown as an individual line item.

The schedule of values, when approved, shall be used as a basis for the Contractor's applications for payment.

### Section 8.02. Basis and Measurement of Payment Quantities.

It is the Contractor's responsibility to measure and/or compute the quantities of work completed, subject to verification by the City, under the terms of the Contract Documents. In computing quantities, the length, area, solid contents, number, weight, or time as specified in the Contract Documents or the Schedule of Values shall be used.

#### A. Unit Price Contracts.

Payment for all work bid at a price per unit of measurement will be based upon the actual quantities of work as measured upon completion. The Estimated Quantities provided in the Bid Documents are for comparative bidding only. The City does not expressly or by implication agree that the actual amount of work or materials will correspond to the Estimated Quantities. The Contractor shall make no claim nor receive any compensation for anticipated profits, loss of profit, damages or any extra payment due to any difference between the amount of work actually done or materials furnished and the Estimated Quantities.

#### B. Lump Sum Contracts.

Items bid on a "Lump Sum" or "Job" basis shall result in a complete structure, operating plant or system in satisfactory working condition in respect to the functional purposes of the installation, and no extra compensation will be allowed for anything omitted but fairly implied. Progress payments will be based on the approved schedule of values.

#### C. Mobilization

Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the Site; for the establishment of all offices, buildings, and other facilities necessary for the Work; and for all other work and operations which must be performed, or costs incurred, prior to beginning the Work.

Payment for mobilization will be as follows:

1. When the Contract does not include a separate pay item for mobilization, full compensation for mobilization will be included in the Contract lump sum price or in the prices paid for the various items of work in a unit price contract, and no additional compensation will be paid.

2. When the Contract or proposed Schedule of Values includes a separate item for mobilization, payment for mobilization will include full compensation for the furnishing of all labor, materials, tools, equipment, administrative costs, and incidentals for mobilization. The City will pay no greater than five percent (5%) of the total Contract Sum as a separate pay item for mobilization. In the event the Contractor submits a mobilization pay item greater than five percent (5%) of the total Contract Sum, the City will pay any excess mobilization amount with the final Progress Payment.

Payment for mobilization will be prorated as follows:

- a. When the Progress Payment request is five percent (5%) or more of the original total Contract Sum (excluding mobilization), fifty percent (50%) of the contract item price for mobilization or two and one-half percent (2.5%) of the total Contract Sum, whichever is less, will be paid for mobilization.
  - b. When the Progress Payment request is ten percent (10%) or more of the original total Contract Sum (excluding mobilization), seventy percent (70%) of the contract item price for mobilization or three and one-half percent (3.5%) of the total Contract Sum, whichever is less, will be paid for mobilization.
  - c. When the Progress Payment request is twenty percent (20%) or more of the original total Contract Sum (excluding mobilization), ninety percent (90%) of the contract item price for mobilization or four and one-half percent (4.5%) of the total Contract Sum, whichever is less, will be paid for mobilization.
  - d. When the Progress Payment request is fifty percent (50%) or more of the original total Contract Sum (excluding mobilization), one hundred percent (100%) of the contract item price for mobilization or five percent (5%) of the total Contract Sum, whichever is less, will be paid for mobilization.
  - e. After final acceptance of the Contract, the amount, if any, of the Contract item price for mobilization in excess of five percent (5%) of the original total Contract Sum will be included for payment in the final estimate.
3. The City will not pay additional mobilization compensation for work under a Contract Change Order. Payment for mobilization shall be subject to retention.

#### Section 8.03. Application for Payment.

- A. On the 25<sup>th</sup> of each month, the Contractor shall submit to the Owner's Representative its progress payment application, with an estimate of the total amount and value of work done, including that done under approved Change Orders or signed written directives, and the acceptable materials furnished and incorporated in the work through the 25 day of the month. The Bid Form or schedule of values shall be used to prepare the progress payment application. The Owner's Representative, Architect or Consulting Engineer and Project Inspector will review the Contractor's proposed percentages of completion and agree on a final percentage to be paid for that month. After deducting all previous payments, retention and other withholdings as specified or allowed in the Contract Documents from the estimated total value, the City will pay the

Contractor the balance.

No progress payment will be made unless all general conditions items demonstrate satisfactory progress.

B. Release of Liens: For each monthly application for payment, following agreement, the Contractor shall submit a conditional lien release warranting that title to all work, labor, materials and equipment covered by the application is free and clear of all liens, claims, security interests or encumbrances. Additionally, the Contractor shall submit unconditional lien releases for all work through the prior progress payment. For final payment, the Contractor and all of its Subcontractors and material suppliers shall submit final conditional and final unconditional lien releases.

C. No progress payment will be released until the Owner's Representative has received all of the following items in acceptable form: as-built updates, schedule updates, certified payroll and other required pay records, and lien releases.

D. Neither the payment, the withholding, nor the retention of all or any portion of any progress payment claimed to be due and owing to the Contractor shall operate in any way to relieve the Contractor from its obligations under this agreement; shall not constitute acceptance of the Work or any portion thereof; and shall in no way reduce the liability of the Contractor to replace unsatisfactory work or material, though the unsatisfactory character of such work or material may not have been apparent or detected at the time such payment was made. The Contractor shall continue diligently to prosecute the Work without reference to the payment, withhold, or retention of any progress payment. The payment, withhold, or retention of any progress payment shall not be grounds for an extension of the Contract Time.

#### Section 8.04. Work Done Without Direct Payment.

Compensation for any portion of the Work not specifically identified in the Bid Form or schedule of values is understood to be included in the price for other items, unless specified in the Special Provisions as extra work. No additional compensation is allowed for additional shifts or premium pay necessary to ensure that the Work is complied within the time limits specified in the Contract Documents.

#### Section 8.05. Payment for Stored Materials.

Payments may be made by the City, at its discretion, on account of materials or equipment not incorporated in the Work but delivered to the Site and suitably stored by the Contractor. Payments for materials or equipment stored shall only be considered upon submission by the Contractor of satisfactory evidence demonstrating that it has acquired title to such material, that the material will be used in the Work, that it is satisfactorily stored, protected and insured, and that the Contractor has undertaken such other procedures satisfactory to the Owner's Representative, Project Inspector, and Architect or Consulting Engineer, to protect the City's interests. Materials stored off-site, to be considered for payment, shall, in addition to the above requirements, be stored in a bonded warehouse, fully insured, and available to the Architect or Consulting Engineer and Owner's Representative for inspection. The Owner's Representative shall have complete discretion as to the amount of material and equipment that may be stored on the Site at any given time.

Section 8.06. Payment; Retention.

There shall be reserved from the monies earned by the Contractor on estimates a sum equal to ten percent of such estimates.

Section 8.07. Posting Securities in Lieu of Withholds.

Pursuant to Public Contract Code Section 22300, at the request and expense of the Contractor, securities equivalent to the amount withheld pursuant to Section 12.04 shall be deposited with the City, State Treasurer or with a state or federally chartered bank in California as the escrow agent, who shall then pay the retainage to the Contractor. Upon satisfactory completion of the Contract, the securities shall be returned to the Contractor.

Alternatively the Contractor may request, pursuant to Public Contract Code Section 22300, and the City shall make payment of retentions under Section 12.04 directly to the escrow agent. The Contractor shall receive the interest earned on the investments upon the same terms provided for in Section 22300 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 City.

Either alternative under this Section may be exercised only if requested in writing by the Contractor within five (5) Calendar Days after its execution of the Contract. The Contractor shall notify its Subcontractors in writing within fifteen (15) Calendar Days of exercising this option.

Securities eligible for investment under this Section shall include those listed in Government Code Section 16430 or bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, stand-by letters of credit, or any other security mutually agreed to by the Contractor and the City.

The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

Section 8.08. Withholding Additional Amounts; Grounds.

In addition to the retention amounts to be withheld, the City may withhold a sufficient amount from any payment or payments otherwise due to the Contractor as in the City's sole discretion may be necessary to protect the City in the event of the following:

- A. Third party claims filed or reasonable evidence indicating probable filing of such claims;
- B. Defective work not remedied;
- C. Failure of the Contractor to make proper payments to any of its Subcontractors or for labor, materials or equipment;
- D. The occurrence of reasonable doubt that the Contract can be completed for the balance of payments then unpaid to the Contractor, or in the time remaining until expiration of the Contract Time;
- E. Failure of the Contractor to comply with any lawful or proper direction concerning the Work given by any City representative authorized to have given such instruction;



F. Claims and/or penalties which state law assesses against the Contractor for violation of such law;

G. Any claim or penalty asserted against the City by virtue of the Contractor's failure to comply with the provisions of all governing laws, ordinances, regulations, rules, and orders;

H. Any reason specified elsewhere in the Contract Documents as grounds for a retention or withholding, or that would legally entitle the City to a set-off.

In order to adequately protect the City, the Contractor agrees that the basic standard to determine the amount to be withheld pursuant to this Section shall be one hundred fifty percent (150%) of the amounts claimed or the value of the work not done or defectively done; provided, however, that City reserves the authority to retain greater sums should such sums be necessary in the City's discretion to adequately protect it.

Section 8.09. Disbursement of Withheld Amounts.

The City, in its sole discretion, may apply any withheld amount or amounts to the payment of any claim resulting in a withhold. The Contractor agrees and hereby designates the City as its agent for such purposes, and any payment so made by the City shall be considered as a payment made under this Contract by the City to the Contractor. The City shall not be liable to the Contractor for any payments made in good faith. Such payments may be made without a prior judicial determination of the claim or claims. The City shall render to the Contractor a proper accounting of any funds disbursed on behalf of the Contractor.

Prior to disbursing any amounts, the City shall afford the Contractor an opportunity to present good cause, if it has any, why the claim or claims in issue are not valid or just claims against the Contractor. The City reserves the right then to take such further steps as are appropriate, in its sole discretion, including, but not limited to, seeking a judicial resolution of the controversy.

Section 8.10. Correction of Statement and Withholding of Payment.

No inaccuracy or error in any statement provided by the Contractor shall operate to release the Contractor or any surety from the error, or from damages arising from such work, or from any obligation imposed by the Contract Documents. The City shall retain the right subsequently to correct any error made in any previously issued claim for the progress payment, or progress payment issued, by adjustments to subsequent payments.

Section 8.11. Final Payment.

When the Contractor determines that all of the Work on the Project is complete and all items on the punch list have been satisfied, or contends that such items are not required by the Contract Documents, the Contractor shall submit an application for final payment. Simultaneously with the Contractor's request for final payment, the Contractor shall submit the following items to the Owner's Representative:

A. Record Documents.

B. All O&M submittals not previously submitted and approved



C. Hazardous material documentation if required.

D. Other items as required in the Special Provisions.

No payment will be processed unless accompanied by the listed documents in acceptable form.

A. Final Payment Process.

Upon receipt of the submittals required by this Article and the Contractor's final payment application, and upon verification that all of the Work is complete, including all punch list items, the Owner's Representative shall either (1) recommend to the City that the payment application be accepted, which recommendation shall be made within five (5) business days of receipt of the Contractor's final payment application, or (2) send a notice to the Contractor rejecting the payment application, stating the basis therefor, and submitting a written estimate of the sum due to the Contractor, which written estimate shall be provided to the Contractor within twenty (20) Calendar Days of the Owner's Representative's receipt of the Contractor's final payment application. The Owner's Representative's estimate shall take into account the Contract Sum, as adjusted by any Change Orders; amounts already paid; and sums to be retained for incomplete work, liquidated damages, and for any other cause under the Contract Documents. Any protest by the Contractor of the Owner's Representative's estimate shall be as set forth below.

The Architect or Consulting Engineer shall prepare a statement of final inspection, stating that the Work has been given a final inspection, that the Contractor has submitted the required documents, setting forth with detail any deviations in the Work as completed from the Contract Documents, and estimating the cost of correction of such deviations.

The Architect's or Consulting Engineer's statement shall be transmitted to the City, along with the Contractor's application for final payment approved by the Owner's Representative, Architect or Consulting Engineer and Project Inspector. The Owner's Representative shall provide a copy of the Architect's or Consulting Engineer's statement of final inspection to the Contractor.

B. Protest of the Owner's Representative's Estimate.

If the Contractor contests the estimate of sums due prepared by the Owner's Representative, the Contractor may file a claim in writing with the Owner's Representative in accordance with Article 9 and setting forth in detail all grounds alleged by the Contractor to justify an adjustment to the Owner's Representative's estimate. The Contractor's claim shall be certified under penalty of perjury and in compliance with the California False Claims Act. Failure to include these required certifications will constitute grounds for immediate rejection of the claim. Failure to file a timely claim shall constitute a waiver and acceptance by the Contractor of the Owner's Representative's estimate, which shall then become final and be forwarded to the City for approval of payment.

C. Approval of Final Payment.

Following acceptance of the Work, the City shall authorize final payment to the Contractor of the undisputed sums found due, subject to retentions for stop notices. This final payment shall be made within sixty (60) Calendar Days after completion, as defined in Section 7.30 above, and recordation of the Notice of Completion.

Section 8.12. Withholding for Stop Notices.

The City may, in its sole discretion, and at any time, withhold from the Contractor any unpaid claims alleged in Stop Notices filed pursuant to Civil Code Section 3179 et seq. The City reserves all remedies it may have in the event of a stop notice dispute. The basic standard to determine a sufficient withholding in the event of a Stop Notice shall be one hundred fifty percent (150%) of the total of all stop notices filed; provided, however, the City reserves the right to withhold different or greater sums in its discretion.

Section 8.13. Non-Waiver.

Neither acceptance of, nor payment for, the Work or any part thereof, nor any extension of time, nor any possession taken by City shall operate as a waiver of any of the provisions of this Contract, nor shall a waiver of any breach of this Contract be held to be a waiver of any other or subsequent breach. In addition, recordation of a Notice of Completion shall not be deemed an acceptance of latent defects, nor shall it constitute a waiver of any of the provisions of this agreement.

## ARTICLE 9. CHANGES AND CLAIMS

### Section 9.01. No Changes Without Consent.

No extra work shall be performed, and no change shall be made, except pursuant to a written Change Order or Proposed Change Order signed by the City, or by CCD signed by either the City or the Owner's Representative, stating that the extra work or change is authorized, and no claim for any addition to the Contract Sum or Contract Time shall be valid unless so authorized; provided, however, that nothing in this Article shall excuse the Contractor from proceeding with the prosecution of the work so changed. The Contractor shall, when required by the Owner's Representative, furnish an itemized breakdown of the quantities and prices used in computing the value of any change requested by the Contractor, or that may have been ordered by the City.

Change Orders shall specify the cost adjustments associated therewith, and in no case shall the City pay or become liable to pay any sums different than those specified or those established under Sections 9.04 and 9.05.

Substitutions are considered change orders.

### Section 9.02. Change Orders.

Subject to legal requirements relating to competitive bidding, the City may require changes in, additions to, or deductions from the work to be performed or the materials to be furnished pursuant to the Contract Documents. Changes may be made pursuant to a written Change Order signed by the City, which shall state the agreement of the City, the Contractor, and the Architect or Consulting Engineer upon all of the following:

- A. The scope of the change in the Work;
- B. The amount of the adjustment in the Contract Sum, if any; and
- C. The extent of the adjustment in the Contract Time, if any.

All adjustments to the Contract Sum or the Contract Time must be approved by the City.

Signature by the Contractor on the Change Order constitutes its agreement with and acceptance of the adjustments in the Contract Sum and Contract Time, if any, set forth in the Change Order as full and complete satisfaction of any direct or indirect additional cost and/or time incurred by the Contractor in connection with performance of the change work.

### Section 9.03. Construction Change Directive/CCD.

Changes also may be made pursuant to a CCD, which shall direct a change in the Work and state a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. A CCD shall be used in the absence of total agreement on the terms of a Change Order, or when time does not permit processing of a Change Order prior to implementation of the change. CCD's shall be approved by the City and the Architect or Consulting Engineer, but need not be signed by the Contractor. Upon receipt of a CCD, the Contractor shall promptly proceed with the change in the work involved. It is the intent of the City that all CCD's will be converted into a Change Order. When a CCD is used because time does not permit processing of a Change Order prior to implementation of the change, signature by the Contractor on the CCD constitutes

its agreement with and acceptance of the adjustments in the Contract Sum and Contract Time, if any, set forth in the CCD as full and complete satisfaction of any direct or indirect additional cost and/or time incurred by the Contractor in connection with performance of the change work.

Section 9.04. Pricing of Changes.

If a Change Order or CCD provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

A. Lump Sum Price.

The Contractor shall submit a lump sum price proposal with a detailed cost breakdown on all labor and materials proposed to be provided by the Contractor's forces or the forces of Subcontractors or material suppliers. The proposal shall include labor surcharges of twenty-six percent (26%), sales tax and markups as specified in Section 9.05 of these General Provisions.

B. Unit Prices.

If payment for Contract work is based on unit prices, payment for changed work will be made based on actual quantities of work done at the unit prices contained in the Contract or unit prices otherwise agreed upon by the City and Contractor if none are contained in the Contract. Payment will be for actual quantities furnished, as described above. Payment for changed work based on Contract or agreed upon unit prices includes the full cost of the item of work, including profit and overhead, and no additional payment or adjustment will be allowed. If the final quantity of any item of work required under the Contract varies from the Estimated Quantity by twenty-five percent (25%) or more, compensation will be adjusted in accordance with State Specification section 4-1.03B, "Increased or Decreased Quantities."

C. Force Account.

In the absence of either an agreed lump sum price or unit prices for the change, the City may direct the Contractor to proceed with the changed work on a force account basis. The Contractor shall be paid for labor, materials and equipment actually used during the performance of the changed work as set forth below, plus the markups specified in Section 9.05 of these General Provisions.

The Contractor shall keep and present daily, in such form as the Owner's Representative may prescribe, an itemized accounting together with appropriate invoices and other supporting data of the labor, materials, and equipment used during that day. All labor shall be recorded on separate time sheets clearly identified with the CCD number and scope of extra work involved. These time sheets shall be signed daily by the Project Inspector or the Owner's Representative. No costs will be allowed for time not recorded and signed the same day the work takes place. The Contractor and the Owner's Representative shall discuss and attempt to resolve any disputes concerning the Contractor's daily records at the time the report is submitted.

The Contractor shall on a monthly basis accompanying the progress payment request submit a reconciliation for all work performed on a force account basis during the period of the progress payment. A final reconciliation shall be submitted within 30 days after the force account work is completed. The reconciliation shall recap all costs and appropriate markups for the period. No costs will be allowed for work not included in a reconciliation within the time periods specified.

To facilitate agreement on direct craft labor hours, construction equipment hours, and material quantities, the Contractor shall notify the Owner's Representative not less than four (4) hours prior to starting force account work.

Allowable costs for force account work are as follows:

1. Labor.

The Contract will be paid the cost of direct labor (foreperson and below) used in the actual and direct performance of the changed work, including working foreman when authorized by the City. Except as otherwise provided, the Contractor will receive no additional compensation for overtime work without prior written authorization of the City. The cost of the labor will be the sum of the following:

- a. Actual Wages: Charges for labor will be the Contractor's actual payroll costs for labor of any classification, including employer payments to or on behalf of the workers for health and welfare, pension, vacation and similar purposes.
- b. Labor Surcharge: A twenty-six percent (26%) surcharge for taxes, insurance, and all other payments made to or on behalf of the employee shall be added to the actual wages.
- c. Subsistence and Travel: The City will pay the Contractor for actual subsistence and travel allowance costs associated with the changed work required by labor agreements or acceptable to the City. Supporting documentation must be provided to the City.

2. Materials.

Payment will be for the purchaser's actual cost of supplier or vendor furnished materials. If the Contractor does not furnish satisfactory evidence of the cost of such materials, the cost will be the lowest current wholesale price at which such quantities of material are available and delivered to the job site. The City reserves the right to purchase materials for changed work, and the Contractor shall have no claims for costs or profit on such materials.

3. Equipment.

The prices paid for equipment directly and solely required for performance of the changed work will be those listed in the current edition of the Caltrans publication, "Labor Surcharge and Equipment Rental Rates". If the equipment is not shown in this publication, the Contractor shall be paid such hourly rental rates as are agreed upon by the Contractor and the Agency prior to use of the equipment, plus thirty-three and one-third percent (33-1/3%) for the cost of fuel, oil, lubrication, and field repairs and maintenance. In no case shall the hourly rental rates exceed those of established distributors or equipment rental agencies serving the area.

The rate paid for the use of equipment constitutes full compensation to the

Contractor for all costs, including fuel, power, oil, lubrication, supplies, small tools, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor (except for equipment operators) and any and all costs to the Contractor incidental to the use of such equipment for the changed work.

Payment will not be made for the equipment while it is inoperative due to breakdowns or for time in which no changed work was performed. Payment for rentals will include time required to move equipment to the changed work from the nearest available rental source and to return it to the source. However, no moving, loading, or transportation costs will be paid if the equipment is used for any other portion of the Work.

Individual pieces of equipment having replacement value of five hundred dollars (\$500) or less shall be considered tools or small equipment and no payment will be made for those pieces of equipment.

#### 4. Subcontracts.

Subcontract costs shall be the actual cost to the Contractor for work performed by a Subcontractor. The provisions set forth above for pricing of force account work apply to the computation of subcontract costs. Subcontractors shall compute markups as set forth in Section 9.05 of these General Provisions.

#### Section 9.05. Markups for Changed Work.

Only direct costs directly attributable to the performance of the changed work shall be allowed. All other costs shall be included in the allowed markups, including, but not limited, to overhead and profit; preparation of all paperwork related to changes in the Work, including field review, estimating and cost breakdown; coordination and supervision, both office and field, including the project superintendent; vehicles including gas and maintenance; small tools, incidentals and consumables; engineering, detailing, and revisions to shop drawings and as-built drawings; general office and administrative expense; extended and unabsorbed home office overhead; warranty; costs of bonds, liability insurance, and all taxes.

The Contractor's combined overhead and profit for work performed by its own forces shall not exceed twenty-five percent (25%) for labor, fifteen percent (15%) for materials, fifteen percent (15%) for equipment and two percent (2%) for bonds and insurance.

If the changed work is performed by a Subcontractor, the Subcontractor shall be entitled to an allowance of fifteen percent (15%) of its actual labor, material and rental costs for overhead and profit.

The Contractor shall be allowed to mark-up the Subcontractor's price five percent (5%) for its overhead and profit. Cumulative total markup for all tiers of contractors and subcontractors shall not exceed thirty percent (30%). If the net value of a change results in a credit from the Contractor or Subcontractor, the credit shall be the actual net cost, plus ten percent (10%) for overhead and profit. When both additions and credits covering related work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase or decrease, if any, with respect to the change.

## Section 9.06. Construction Incentive Change Proposal (CICP).

### A. General.

The Construction Incentive Change Proposal (CICP) Program provides a program for the Contractor to use its expertise to improve Contract performance to create an overall reduction in the total cost of the Contract. Proposing to delete work is not a CICP. Deleted work is addressed in Section 4.11 of these General Provisions. The CICP Program shall not apply to City contracts which have a cost of less than \$100,000. The Contractor and subcontractors may participate in the CICP Program. Participation of Subcontractors shall be through the Contractor; the Contractor and Subcontractor must agree upon the sharing agreement; and evidence of such agreement must be submitted with the CICP.

While a CICP is being considered or processed, the Contractor shall proceed with the Work as scheduled.

### B. Description

A CICP is a formally written proposal for a Change Order. A CICP must be initiated, developed and identified as such by the Contractor or Subcontractor. A CICP must result in a net capital cost reduction while causing no increase in the total life cycle cost of the Project and shall comply with the following conditions:

1. Required function, reliability and safety of the Project will be maintained without detracting from the life expectancy or increasing maintenance requirements.
2. The proposed change shall not cause undue interruption of the Work, nor shall it extend the Contract Time.
3. The proposed change shall comply with all applicable permits, regulations and code requirements, and any other requirements set forth in the Contract Documents. The proposed change shall not involve payment of royalties by the City to the Contractor.

### C. Submittal.

The Contractor shall submit a brief description of the proposed CICP prior to preparing the detailed submittal as outlined below.

A CICP submittal must contain pertinent information in supporting documents for City evaluation. As a minimum, the following information shall be submitted:

1. Name of individuals associated with the development and preparation of the CICP.
2. A detailed description and duly signed plans and specifications showing work as presently designed and the proposed changes.
3. A clear identification of all advantages and disadvantages for each proposed change.



4. A detailed procedure and schedule for implementing the proposed change. This detailed procedure and schedule shall include all necessary Contract amendments. Also indicated must be the latest date that the CICIP can be approved for implementation.
5. A summary of estimated costs, including the following:
  - a. Project construction costs before and after the CICIP. This shall be a detailed estimate identifying the following items for each trade involved in the CICIP: (i) quantities of material and equipment; (ii) unit prices of materials and equipment; (iii) labor hours and rates for installation; (iv) Contractor and Subcontractor markups; (v) operation and maintenance costs before and after the CICIP; and (vi) cost for implementing the CICIP not included elsewhere.
  - b. Contractor's share of savings based on the sharing provision below.
  - c. Other data as required by local permits and regulations and code requirements set forth in the Contract.
6. Time required for execution of the proposed change.

To the extent indicated herein, the Contractor may restrict the City's use of any CICIP or the supporting data submitted pursuant to this Program. Suggested wording for inclusion in CICIP's is as follows:

"This data furnished pursuant to the construction incentive clause of the Contract shall not be disclosed or duplicated in whole or in part beyond what is necessary to accomplish the review. This restriction does not limit the City's right to use the information if it is available from any source without limitations. The City has the right to duplicate, use and disclose any information if the CICIP is accepted."

The City may modify, accept or reject the CICIP. However, if the CICIP is modified or not acted upon with the time allotted in the proposal, the City will not be liable for the Contractor's cost of developing the CICIP if it is withdrawn or rejected.

#### D. Acceptance.

If the CICIP is accepted by the City, the processing procedure specified for Change Orders shall be used. Approval of the CICIP by the Architect or Consulting Engineer is required. If the CICIP is rejected, the Contractor may not, and shall not, appeal the decision.

#### E. Sharing Provisions.

Upon acceptance of the CICIP, the Contractor shall received fifty percent (50%) of the net capital savings based on the following formula:

$$\text{Net Capital Savings} = (\text{Contract Cost Prior to CICIP} + \text{City's cost incurred in reviewing, redesigning and processing the CICIP}) - (\text{Revised Contract Cost After})$$



CICP + CICP Development Cost + CICP Implementation Cost)

The Contractor's development cost is limited to that directly associated with the preparation of the CICP package. Development costs will be reimbursed after approval. However, the City will reject costs that cannot be satisfactorily substantiated.

Section 9.07. Effect on Sureties.

All changes authorized by the Contract Documents may be made without notice to or consent of the sureties on the contract bonds, and shall not reduce the sureties' liability on the bonds.

The City reserves the right to require additional payment or performance bonds to secure a Change Order.

Section 9.08. Unforeseen Site Conditions.

The Contractor shall promptly, and before the condition is disturbed, notify the Owner's Representative, in writing, of any:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.
2. Subsurface or latent physical conditions at the Site differing materially from those indicated in the Contract Documents.
3. Unknown physical conditions at the Site of any unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

Upon receipt of notice from the Contractor, the Owner's Representative and the Architect or Consulting Engineer shall promptly investigate the conditions, and if it is determined that the conditions do materially so differ or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a Change Order or CCD under the procedures described in the Contract Documents.

In the event that a dispute arises between the City and the Contractor as to whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract Documents, but shall proceed with all work to be performed under the Contract Documents. The Contractor shall retain any and all rights provided either by the Contract Documents or by law which pertain to the resolution of disputes and protests between the contracting parties. No contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice under this Section

No contract adjustment will be allowed under the provisions specified in this Section for any effects caused on unchanged work.

Section 9.09. Notice of Potential Claim.

The Contractor shall not be entitled to payment of any additional compensation for any cause, including any disagreement, protest or change, any act or failure to act by the City, or the happening of any event, thing or occurrence, unless the Contractor first has given the City due advance written notice of potential claim as hereinafter specified. The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation and/or time will or may be due, the nature of the costs and/or time involved, and, insofar as possible, the amount of the potential claim. The notice must be given to the Owner's Representative prior to the time the Contractor performed the work giving rise to the potential claim for compensation, if based on an act or failure to act by the City, or in all other cases, within fifteen (15) Calendar Days of the happening of the event, thing, occurrence or other cause giving rise to the potential claim.

See Article 7, Section 7.15 for additional notice requirements related to time extensions.

The Contractor hereby agrees that the Contractor shall have no right to additional compensation for any claim that may be based on any such fact, failure to act, event, thing, occurrence or other cause for which no written notice of potential claim as required herein was filed.

Section 9.10. Claims in Excess of \$375,000.

For all claims in excess of \$375,000, Contractor shall give written notice of claim to the Owner's Representative within thirty (30) Calendar Days of the date of the Owner's Representative's estimate of sums due under Section 8.11 of these General Provisions, stating in detail all grounds alleged by the Contractor to justify an adjustment to the Owner's Representative's estimate and submitting all supporting documents and schedules. Thereafter, the claim shall be resolved in accordance with Section 9204 of the Public Contract Code.

The Contractor's notice of claim shall be certified under penalty of perjury and in compliance with the California False Claims Act, as set forth in Section 9.12 below. Failure to include these required certifications will constitute grounds for immediate rejection of the claim and shall be deemed a waiver and absolute bar of the claim, including any right to pursue the claim further.

Failure to comply with these notice and/or time requirements shall constitute a waiver of the claim and an absolute bar against further pursuing the claim.

After compliance with Section 9204 of the Public Contract Code, if mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to and Contractor must comply with the requirements of the California Government Code regarding claims against public entities (Government Code Sections 900 and following).

Section 9.11. Claims of \$375,000 or Less.

For all claims of \$375,000 or less, Contractor shall give written notice of claim to the Owner's Representative within thirty (30) Calendar Days of the date of the Owner's Representative's estimate of sums due under Section 8.11 of these General Provisions, stating in detail all grounds alleged by the Contractor to justify an adjustment to the Owner's Representative's estimate and submitting all supporting documents and schedules. Thereafter, the claim shall be resolved in accordance with Section 9204 of the Public Contract Code.

The Contractor's notice of claim shall be certified under penalty of perjury and in compliance with the California False Claims Act, as set forth in Section 9.12 below. Failure to include these

required certifications will constitute grounds for immediate rejection of the claim and shall be deemed a waiver and absolute bar of the claim, including any right to pursue the claim further.

After compliance with Section 9204 of the Public Contract Code, if mediation is unsuccessful, the parts of the claim remaining in dispute shall be resolved in accordance with Section 20104 et seq. of the Public Contract Code.

Section 9.12. Claim Certification.

Contractor acknowledges that it has read and is familiar with the provisions of the False Claims Act (California Government Code §12650 et seq.). Submission by Contractor of any claim (as the term “claim” is defined in False Claims Act) to the City in connection with the Project, whether on its behalf or on behalf of a Subcontractor or material supplier, shall constitute a representation by Contractor to the City that submission of the claim does not in any respect, violate the False Claims Act. Any party with an interest in the claim, including Contractor and any Subcontractor or material supplier, shall certify under penalty of perjury the validity and accuracy of any claim submitted to the City, as provided below. Compliance with this claims certification requirement shall be a condition precedent to any obligation City might otherwise have to review the claim and failure to provide such certification shall constitute a waiver of the claim.

The claim certification required by this section shall provide as follows:

CLAIM CERTIFICATION

Under penalty of perjury, and with specific reference to the California False Claims Act, Government Code sections 12650, et seq. I certify that submission of the attached claim is made in good faith; that the supporting data prepared by the undersigned company are accurate and complete to the best of my knowledge and belief; that submission of the claim to the City does not violate the False Claims Act; and that I am duly authorized to certify the claim on behalf of the claimant.

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

Signature \_\_\_\_\_

Title \_\_\_\_\_

Section 9.13 Claim Resolution

Public Contract Code Section 9204 provides, in summary:

The claim resolution procedures in Public Contract Code Section 9204 apply to any claim by a contractor in connection with a public works project.

For purposes of Public Contract Code Section 9204, “claim” means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for

delay assessed by the City under a contract for a public works project.

(B) Payment by the City of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the City.

Upon receipt of a claim pursuant to Section 9.10 or Section 9.11 above, the City shall review the claim and, within 45 days, provide Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. The City and Contractor may extend the 45 day time period by mutual written agreement.

Contractor shall furnish reasonable documentation to support the claim.

Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the City issues its written statement. If no written statement is issued, the claim shall be deemed disputed in its entirety.

If Contractor disputes the City's written statement, or if the City fails to respond to a claim within the timeframe stated above, Contractor may demand in writing, sent by registered mail or certified mail, return receipt requested, an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of such a written demand, the City shall schedule a meet and confer conference within 30 calendar days.

Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion thereof remains in dispute, the City shall provide Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed.

Any disputed portion of the claim shall be submitted to nonbinding mediation, with the City and Contractor sharing the associated costs equally. Mediation includes any nonbinding process in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation.

The City and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing as described above. If the parties cannot agree on a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures described in Section 9.10 or 9.11 above, depending on the amount of the claim remaining in dispute.

Failure by the City to respond to a claim within the time periods described in this Section or to otherwise meet the time requirements of this Section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the City's failure to have responded, or its failure to otherwise meet the time requirements of this Section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

If a subcontractor or lower tier subcontractor lacks standing to assert a claim against the City because privity of contract does not exist, Contractor may present to the City a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on its own behalf or on behalf of a lower tier subcontractor, that Contractor present a claim to the City for work which was performed by the subcontractor or a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the City shall furnish documentation to support the claim. Within 45 calendar days of receipt of the written request, Contractor shall notify the subcontractor in writing as to whether Contractor presented the claim to the City and, if Contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

The City may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this Section, so long as the provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this Section.

Amounts not paid within the time periods required by this Section shall bear interest at 7 percent per annum.

A waiver of the rights granted by this Section is void, provided, however, that upon receipt of a claim, the parties may mutually agree in writing to waive mediation and proceed directly to commencement of a civil action or binding arbitration, as applicable.

## ARTICLE 10. SAFETY, CONFINED SPACES, TRAFFIC CONTROL, UTILITIES AND TRENCHING

### Section 10.01. General Safety Requirements.

The Contractor shall comply with all safety requirements in the General Provisions, as well as with all applicable occupational safety and health standards and rules set up to help eliminate or limit workplace hazards proven or suspected by research or experience to be harmful to personal safety and health

The Contractor shall have on record with the City the following twenty-four (24) hour emergency contact numbers:

- A. Traffic control device supplier: Supplier of barricades, steel plates, delineators, channelizers, construction signs, and other traffic control equipment to be used during construction.
- B. Contractor representative: An employee of the Contractor having the authority to make decisions and the ability to respond to an emergency on the project at any time.
- C. Safety Representative: The Contractor's Safety Representative shall have the authority to make decisions regarding safety and health concerns on the project and to direct the Contractor's personnel to abate any hazard identified by the City.

### Section 10.02. Work During Hours of Darkness.

Working areas utilized by the Contractor during the hours of darkness shall be illuminated to conform to the minimum illumination intensities established by California Occupational Safety and Health Administrative Construction Safety Orders.

### Section 10.03. Sewers and Appurtenances/Contaminations.

The Contractor is warned that when the work involves existing sewers and appurtenances that have been exposed to sewage and industrial wastes, these facilities shall be considered contaminated with disease-causing organisms. Personnel in contact with contaminated facilities, debris, wastewater or similar items shall be advised by the Contractor of the necessary precautions that must be taken to avoid becoming diseased. It is the Contractor's responsibility to urge its personnel to observe a strict regiment of proper hygienic precautions, including any inoculations recommended by the local public health officer.

Because of the potential danger of solvents, gasoline, and other hazardous material in the existing sewer and storm drain pipes, these areas shall be considered hazardous. The Contractor shall be aware of these dangers and shall comply with Article 108, "Confined Spaces", of the General Industrial Safety Orders (Cal-OSHA) contained in the California Administrative Code, Title 8.

### Section 10.04. Confined Spaces.

When working in a confined space, the Contractor shall comply with all requirements of Article 108, "Confined Spaces", of the General Industrial Safety Orders (Cal-OSHA), contained in the California Administrative Code, Title 8, sections 5156 through 5159 ("Article 108"). The Contractor shall provide all monitoring and safety equipment necessary to perform pre-entry

checks of all confined spaces. The Contractor shall also provide all monitoring, safety and communications equipment required for operations in those confined spaces requiring conformance to Article 108.

Identified on the Contract Drawings are those confined spaces for which the City has determined, based upon experience or knowledge that an environment free of dangerous air contamination and/or oxygen deficiency cannot be ensured through the implementation of the applicable provisions of Article 108. The Contractor shall be provided with information regarding known hazards and known or potential permit spaces.

For entry into designated confined spaces, as well as permit-required confined spaces, the Contractor shall follow all procedures required for conformance with Article 108.

To assure compliance with the above, the Contractor shall submit for review to the Owner's Representative:

- A. The Contractor's detailed procedures for confined space operation, including without limitation, operating, rescue and surveillance of surrounding areas procedures.
- B. Copies of all documents and certificates that qualify the Contractor to safely perform work in confined spaces. The Contractor shall also submit all applicable Materials Safety Data Sheets (MSDS) and hazard information on chemicals, products, materials or procedures.
- C. Sufficient documentation and evidence that a confined space entry can be made in accordance with Article 108. Documentation shall include, but not be limited to the following:
  - Equipment availability, suitability and integrity
  - Personnel training
  - Experience
  - Supervision
  - Safety
  - Accident experience
  - Permit-required confined space policy
  - Lock-out/tag-out procedures (if applicable)
  - Hot work procedures (if applicable)

The Contractor's submittal shall be made at least ten (10) Calendar Days prior to any confined space entry in accordance with the requirements of Article 5, Section 5.10 of the General Provisions of the City's Standard Specifications and must be determined to be satisfactory by the City before such work will be allowed to proceed. The Contractor shall conform to the procedures established by its submittal at all times during operations in all confined space operations.

After the City has reviewed the Contractor's submittal to perform confined space entry work, the Contractor will be provided with the following:

- A. Notification of the location, physical characteristics, known hazards, etc. regarding



the confined space the Contractor anticipates entering.

- B. Information regarding safety items (e.g., nearby emergency equipment), precautions, procedures, safeguards, etc. installed or implemented and that may be available to the Contractor's employees in or near the confined space.

A debriefing session will be held with the Contractor at the conclusion of the entry operation to ascertain if any hazards were encountered or created and remain.

Failure of the City to identify a confined space shall not relieve the Contractor of its responsibility to conform to the requirements of Article 108 and this Section of the General Provisions.

#### Section 10.05. Public Convenience and Safety.

##### A. Public Convenience.

All work within public streets and/or roadway rights-of-way shall be done in an expeditious manner and cause as little inconvenience to the traveling public as possible. All public traffic shall be permitted to pass through the Work, and the Contractor shall conduct operations so as to offer the least possible obstruction and inconvenience to the public. Vehicles, bicycles, and pedestrians must be allowed to pass at all times except during an emergency closure.

In addition to the requirements for furnishing facilities for public safety as specified in Section 10.06 of these General Provisions, the Contractor shall erect such warning and directional signs as necessary or as directed by the Engineer for expediting the passage of public traffic through or around the Work and the approaches thereto. All warning and directional signs shall comply with Section 10.06, "Public Safety and Traffic Control", of these General Provisions and the Caltrans Manual of Traffic Controls. The Owner's Representative shall be notified at least twenty-four (24) hours in advance of the Contractor's desire to change any existing traffic patterns. No changes shall be made until approved by the Owner's Representative.

In addition to the requirements for furnishing facilities for public safety as specified in Section 10.06 of these General Provisions, the Contractor shall erect such warning and directional signs as necessary or as directed by the Engineer for expediting the passage of public traffic through or around the Work and the approaches thereto. All warning and directional signs shall comply with Section 10.06, "Public Safety and Traffic Control", of these General Provisions and the Caltrans Manual of Traffic Controls. The Owner's Representative shall be notified at least twenty-four (24) hours in advance of the Contractor's desire to change any existing traffic patterns. No changes shall be made until approved by the Owner's Representative.

When traffic control signals are shut down as provided in Section 86-1.05 of the State Specifications, the Contractor shall control traffic by the use of flaggers, as directed by the Engineer, at those locations set forth in the Special Provisions. No STOP signs will be permitted at these locations. The flaggers required for this operation shall be paid for as extra work as set forth in Article 8 of the General Provisions of the City's Standard Specifications.



When pipelines, to be installed under the Contract, cross certain streets or highways, as noted on the plans, the Contractor will be permitted to open the trench for only a portion of the width of the pavement at any one time so that one-way traffic can be maintained.

Water or dust palliative shall be applied if ordered by the City for the alleviation or prevention of dust nuisance caused by the Contractor's operations.

Fire hydrants on or adjacent to the Work shall be kept accessible to fire-fighting equipment at all times.

**B. Pedestrian and Bicyclist Access.**

The Contractor shall not block the movement of pedestrian or bicycle traffic. The Contractor shall provide for pedestrian and bicycle traffic by phasing construction operations or by providing alternative pedestrian and bicyclist access through or adjacent to construction areas. Effort must be made to separate the pedestrian or bicycle traffic from the work area. Proper advance notice signage with reasonable detours shall be installed and maintained through all phases of construction. Access to pedestrian and bicycle devices at traffic signals shall be maintained at all times. At no time shall pedestrians be diverted into a portion of the street used for vehicular traffic or on to private property unless adequate lane closure signage is in place. Walkways in construction areas shall be maintained smooth and be free of abrupt changes in grade. Pedestrian and bicycle access shall consist of four-foot (4') wide bridges across trenches and four-foot (4') wide passageways through construction areas. Hand railings for pedestrians shall be provided when required by Cal-OSHA Regulations or the Americans with Disabilities Act (ADA) on each side of each bridge or passageway to protect pedestrians from hazards caused by construction operations or adjacent vehicular traffic.

Railings or barricades, which border passageways located in roadway areas, shall be reflectorized on the side facing oncoming traffic.

**C. Written Notification to Residences and Businesses**

The Contractor shall notify, in writing, residents and business establishments along the route of the Work at least ten (10) Working Days prior to road closures and at least three (3) Working Days prior to disruption of ingress and egress. The notice provided to the residences or businesses shall include, at a minimum, schedule of closures and/or parking restrictions with estimated closure and/or parking restriction times, closure and/or parking restriction location, alternate route or detour, and name and twenty-four (24) hour phone number of a contact person employed by the Contractor.

**D. Access to Driveways, Houses and Buildings.**

Access and passable grades shall be maintained at all times for business establishments during construction. Safe and passable pedestrian, bicyclist, and vehicular access shall be provided and maintained to fire hydrants, homes, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, hospitals, and establishments of similar nature. Access to these facilities shall be continuous and unobstructed unless otherwise approved. Ramps and driveways shall not have "lips" or elevation differences greater than three-eighths of an inch (3/8") or one (1) cm.

When abutting property owner's access across the right-of-way line is to be eliminated, repaired, or replaced under the Contract, the existing access shall not be closed until the replacement access facilities are completed and functional.

E. Property Damage.

Any property damage caused by the Contractor shall be repaired at the Contractor's expense to the satisfaction of the City.

F. Work On Private Property.

The Contractor must obtain written permission from the owner of any privately owned property prior to beginning any work, storing materials or otherwise conducting any operations on said property. The written approval from the property owner must be on file with the City before any operations will be permitted on said property.

G. Hazardous Conditions Created.

Whenever the Contractor's operations create a condition hazardous to pedestrians, bicyclists, or the traveling public, the Contractor shall, at the Contractor's own expense, furnish, erect and maintain any fences, temporary railing (Type K), barricades, lights, signs and other devices necessary or as directed by the City to prevent accidents or damage or injury to the public or property.

If needed for public use, roadway excavation shall be conducted to maintain a smooth and even surface satisfactory for use by public traffic at all times. The surface of the roadbed shall be kept in a smooth, even condition free of humps and depressions, satisfactory for the use of public traffic as determined by the City.

Temporary facilities that the Contractor uses to perform the Work or store or stage material or equipment shall not be installed or placed where they will interfere with the free and safe passage of public vehicular, bicycle, or pedestrian traffic, and at the end of each day's work and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from the portion of the roadway open for use by public traffic. Spillage resulting from hauling operations along or across any public traveled way shall be removed promptly, before the end of the working day.

Section 10.06. Public Safety and Traffic Control.

A. Responsibility for Safety.

It is the Contractor's responsibility to provide for public safety and traffic control. The Contractor shall furnish, erect and maintain such warning devices as are necessary to protect the public. The Engineer may review the Contractor's operations and/or warning devices and inform the Contractor if an unsafe or hazardous condition is observed. The Contractor may be directed by the Engineer to abate the hazard. The Contractor must comply with all directives for hazard abatement immediately and within the timeframe imposed by the Engineer. However, the Contractor shall not be relieved of its responsibility to protect the public by any approval given by the Engineer or by the Engineer's failure to point out any deficiency.

B. Passage of Emergency Vehicles.

The Contractor shall provide for the uninterrupted passage of emergency vehicles

through the Work zone at all times regardless of the controlled traffic conditions in place at the time.

### C. Traffic Controls.

The protection and maintenance of existing signs and the removal, protection, storage and resetting of City traffic signs that are affected by the Work shall be the responsibility of the Contractor, as directed by the Engineer, or as specified in the Special Provisions. The Contractor shall inventory all existing signs prior to the start of work. The Engineer shall confirm the inventory in writing prior to the start of work. Traffic signs and traffic control facilities existing within the limits of the Project shall not be moved except as necessary to prevent them from being damaged by construction operations. When a sign needs to be removed because it interferes with the Contractor's work, it shall be done in one of the following prescribed manners:

1. Stop signs and other traffic control signs and facilities necessary for the control of traffic during the project shall be maintained in their original positions, as noted in the inventory, except for temporary repositioning necessitated by the Contractor's work. No signs shall be moved from their original positions without prior approval of the Engineer. Temporary sign positions must be equivalent to the original positions for driver visibility. The standard sign position is seven (7) to ten (10) feet from the edge of pavement. Stop signs should not normally be located more than thirty (30) feet from the roadway painted centerline (unless they are supplemental signs), more than forty (40) feet in advance of the limit line, or more than twenty (20) feet beyond the limit line. When the intersection approach width for one direction of traffic is thirty (30) feet or more, the Engineer may require that stop signs be erected both on the left and right sides of that approach.

Stop signs and other traffic control signs in temporary positions may be mounted on portable supports only during working hours when the Contractor's workers are available to maintain the signs in proper position at all times. The position and mounting devices for temporary signs shall be subject to the approval of the Engineer.

Outside of working hours, and at all other times when no Contractor's workers are available to maintain signs on portable temporary supports, all temporary stop signs and other traffic control signs must be mounted on their original or equivalent posts. The posts must be set in the ground with compacted backfill, to a depth of at least thirty-two (32) inches, in the same way that permanent sign are installed. The bottom of the sign plate must be at least five (5) feet but not more than seven (7) feet above the ground, and must be seven (7) feet above the ground if subject to pedestrian traffic adjacent to the post.

2. Traffic signs and traffic control facilities not necessary for the control of traffic during the Project shall be removed and salvaged by the Contractor. When signs are removed and salvaged as provided herein, they shall be stockpiled as noted in Section 15-2.04 of the State Specifications, in an upright position,

and the City Traffic Sign Maintenance Section shall be notified within twenty-four (24) hours of such stockpiling.

The project sign inventory shall indicate which of the above categories applies to each sign, subject to approval by the Engineer.

No additional payment shall be made for the above-described work. It shall be included in the unit prices for other activities.

The cost of work incurred by the City sign maintenance forces as a result of the failure of the Contractor to satisfactorily protect, maintain and reinstall City signs within the construction Project as set forth herein shall be subject to deduction from contract progress payments due to the Contractor.

The Contractor shall, forty-eight (48) hours in advance of beginning any work, notify the Engineer in writing of the name, location and twenty-four (24) hour per day telephone number of the company which will supply barricade and warning devices for the Project. Said supplier must be approved by the Engineer and must be available on a twenty-four (24) hour basis for maintaining, placing, and replacing barricades and warning devices. If the Engineer is unable to contact the Contractor or its superintendent, the supplier will be called directly, and the Contractor shall accept charges made by the supplier for service performed, as a result of the Engineer's call.

Reference is made to the requirements of California Vehicle Code, section 21400 et seq. regarding traffic control devices and barricades. All signs, barricades, delineators, and other traffic control devices used for the detouring or routing of traffic in, around, and through the construction area, shall conform to those standards set forth in the latest edition of the State of California, Department of Transportation "Manual of Traffic Controls for Construction and Maintenance Work Zones." Delineators shall have a Type III reflective sheeting surface of not less than 3" x 12". Barricades and delineators shall be maintained so that the reflective materials are clean and visible during hours of darkness.

A high level warning device is required for use on major streets at the direction of the Engineer, when a lane is closed or work encroaches in a lane of traffic or when barricades are placed in a moving lane of traffic. A single barricade shall not be placed alone in the traveled way.

Use of flashing arrow signs is required on major (four or more lanes) streets for lane closures during hours of darkness and for all lane closures lasting more than two (2) hours.

On major streets, opposing traffic is separated by delineators, traffic striping, or raised pavement markers. Where traffic is diverted to the left of an existing double yellow centerline into a painted median, or into a left-turn lane, delineators are to be utilized beyond the work and to return traffic to normal lanes.

All delineators used during hours of darkness must be stabilized by being nailed or fastened to the pavement.

Unless specifically set forth in the Special Provisions, all marked lanes of traffic shall be open on all major streets in each direction during the peak traffic hours of 7:00 a.m. to 8:00 a.m. and 3:30 p.m. to 6:00 p.m.

During the first Friday after Thanksgiving and the last twenty-four (24) Calendar Days of December, the Contractor shall not close any traffic lanes on a major street except as provided in the Special Provisions. The Engineer may grant permission to close traffic lanes on a major street when the Contractor submits a written request two (2) Working Days in advance, and the Contractor receives written permission from the Engineer. The directional flow of traffic, the proximity to retail business, the total flow of traffic related to the capacity of the roadway, and the interference to public safety will be conditions the Engineer considers in determining whether to grant or deny permission.

If, for an emergency, the Contractor is required to close a lane on a major street during peak traffic hours or during the last twenty-four (24) Calendar Days of December, the Contractor shall immediately notify the City Construction Inspection office.

A traffic lane shall be considered open if it is surfaced with asphalt at least ten (10) feet wide.

Major streets are those roadways with two or more marked traffic lanes in each direction or other street as determined by the Engineer.

A detailed traffic plan, prepared by a qualified Engineer will be required for lane closures during the hours of darkness or lasting more than one (1) day and shall be submitted for approval by the Engineer at least ten (10) Working Days prior to the proposed lane closure.

The Engineer may approve in writing traffic restrictions necessary for public safety or emergency conditions during peak traffic hours, and during the month of December.

The Contractor shall maintain traffic cones, barricades, temporary striping, or yellow delineators (reflectorized or illuminated) within and on the approaches to the Project to properly indicate to the motorist the driving centerline of the roadway. (The motorist shall be permitted to drive to the right of these devices as provided in the California Vehicle Code.) At least one barricade or delineator shall be placed approximately each fifty (50) feet and a C30 sign approximately each five hundred (500) feet adjacent to the work area. The cone spacing in the tapers shall be in accordance with Section 7-1.09 of the State Standard Specifications. The Contractor may remove the barricades at the direction of the Engineer if they interfere with the movement of traffic, under special conditions; however, the barricades shall be replaced when the Engineer determines the special conditions no longer apply. In lieu of barricades, temporary paint striping, or traffic cones may be used. To delineate the centerline of the roadway, the Contractor may use construction grade pavement striping tape (reflectorized). Six-inch (6") by four-inch (4") minimum pieces of tape shall be placed on the centerline at 25-foot (25') (maximum) intervals.

The Contractor shall not remove from the Project barricades or other traffic control devices placed within the Project limits, or on the approaches to the Project, for the direction and protection of the traveling public, until the Contractor has given three (3)

Working Days' advance written notice to the Engineer. Such notice shall also constitute the Contractor's request for City installation of permanent directional and control signs, striping, and markings on public roads. Neither the notice nor the placing of signs, striping, and/or markings shall in any way relieve the Contractor of its responsibility under the terms of the Contract.

Should the Contractor desire the City to do signing and striping on public roads and streets in advance of the timing set forth herein, a separate letter agreement may be made between the City and the Contractor.

On new developments, the Contractor will be required to maintain a Type III barricade eight (8) feet in length in the center of the road indicating that the road is closed except to construction personnel. The barricade is not to be removed until the Project is accepted by the City, and the City has provided any necessary signs and striping.

The Contractor shall do all traffic control work without direct payment as specified in Article 8, Section 8.04 of the General Provisions of the City's Standard Specifications, except as directed by the Engineer during times when traffic signals are out of service, as set forth in Section 10.05 of these General Provisions.

D. Inadequate Traffic Controls and After-Hour Maintenance and Repairs.

Should the Contractor appear negligent in furnishing and maintaining sufficient traffic control devices or protective measures or fail to provide flaggers as necessary to control traffic, the Engineer may direct the Contractor, at the Contractor's expense, to abate the hazard.

Should the Engineer point out the inadequacy of warning devices and protective measures, that action shall not relieve the Contractor from responsibility for public safety or abrogate the obligation to furnish and pay for these devices and measures.

Should the Contractor fail to properly furnish or maintain traffic controls, or correct a hazard caused by inadequate or inappropriate traffic control, the City will abate the hazard. All City costs to abate the hazard shall be reimbursed by the Contractor or deducted from the progress payment.

E. Competent Flaggers.

Whenever the Contractor's operations require one-way traffic or create a condition hazardous to the public traffic, or whenever requested by the Engineer, the Contractor shall provide competent and courteous flaggers whose sole duties shall consist of directing the movement of public traffic through or around the Work. All flaggers shall be trained as required by Cal-OSHA Regulations and shall be prepared to provide verification of such training to the City when requested.

F. Construction Signs.

The Contractor is responsible for supplying, installing and maintaining all construction signs and posts. Construction signs used in the City shall conform to the following minimum sizes:



<u>Sign Code</u>	<u>Minimum Size</u>
W1 (Rt or Lt)	30" x 30"
W2 (Rt or Lt)	30" x 30"
W3 (Rt or Lt)	30" x 30"
W5 (Rt or Lt)	30" x 30"
W6	24" x 24"
W11	30" x 30"
W15	30" x 30"
W18	30" x 30"
W19	30" x 30"
W33	30" x 30"
W44	36" x 36"
W50	30" x 30"
W58	36" x 36"
SW42	30" x 30"
SW43 (Rt or Lt)	30" x 30"
SW44 (Rt or Lt)	30" x 30"
Type K Marker	15" x 6"
Type L Marker	8" x 24"
Type N Marker	18" x 18"
Type P Marker	12" x 36"
Other Warning Signs	0" x 30"

<u>Sign Code</u>	<u>Minimum Size</u>
C1	36" x 36"
C2	36" x 24"
C3	40" x 20"
C3A	40" x 20"
C4	24" x 24"
C5 (Rt or Lt)	36" x 12"
C6	24" x 24"
C7	20" x 12"
C8	30" x 30"
C9A	36" x 36"
C10	24" x 24"
C11	48" x 30"
C13	48" x 18"
C14	28" x 12"
C16	36" x 36"
C18	36" x 36"
C19	36" x 36"
C20 (Rt or Lt)	36" x 36"
C21	36" x 36"
C22B	24" x 24"
C22C	24" x 12"
C23	24" x 24"
C24	24" x 24"
C25	24" x 24"
C27	24" x 24"
C28A	18" x 18"
C28B	18" x 18"
C29	24" x 7"
C30	36" x 24"
C32	36" x 24"
C36	36" x 36"
Other Construction Signs	30" x 30"

<u>Sign Code</u>	<u>Minimum Size</u>
R1	30"
R7	24" x 30"
R7A	24" x 18"
R10 (Rt or Lt)	36" x 12"
R11	30" x 30"
R11A	30" x 18"
R16	24" x 24"
R16A	24" x 18"
R17	24" x 24"
R17A	24" x 18"
R18-1 (Rt or Lt)	20" x 32"
R18-2 (Rt or Lt)	36" x 36"
R41	24" x 30"
R42	24" x 30"
Other Regulatory	

Signs

30" x 30"

G. Temporary Bridging of Excavations and Trenches.

Whenever necessary or requested by the City, trenches and excavations shall be bridged to allow an unobstructed flow of traffic.

1. Bridging shall be secured against displacement by using adjustable cleats, angle, bolts or other devices.
2. Bridging shall be placed and secured to work within the minimum noise levels in accordance with City Code, Section 8.24, "Notice Control".
3. Steel plates used for bridging shall extend at least one (1) trench width on each side beyond the edges of the trench. Temporary paving materials shall be used to feather the edges of the plates to minimize wheel impact.
4. Depending upon the depth of the excavation, soil type, vibration and other variables, the trench may require shoring to support bridging. The Contractor should confer with a California Licensed Engineer or other appropriate professional if there is any question about the capability of the excavation and bridging to support the forces of traffic.

WIDTH OF EXCAVATION	MINIMUM THICKNESS OF STEEL PLATES
2.0 ft. or less (0.6 m or less)	7/8 inch (22mm)
3.0 ft. (0.09 m)	1 inch (26 mm)
4.0 ft. (1.2 m)	1-1/4 inch (32 mm)

Whenever the work area is adjacent to a traffic lane and there is a pavement cut, ditch or trench over two (2) inches deep, the Contractor shall maintain continuous barricades spaced at approximately twenty-foot (20') intervals for the first one hundred (100) feet from the beginning of the cut, ditch or trench and at approximately fifty-foot (50') intervals thereafter. If the cut, ditch or trench is more than ten (10) feet from a traffic lane, the spacing may be greater but must not exceed two hundred (200) feet.

H. Entering and Leaving the Construction Zone.

Construction equipment shall enter and leave the roadway by moving in the direction of public traffic. All movements of workmen and construction equipment on or across lanes open to public traffic shall be performed in a safe manner that will not endanger the workmen or the public. When leaving a work area and entering a roadway carrying public traffic, the Contractor's equipment operator shall yield to public traffic.

I. Bus Stops.

If construction operations will obstruct a bus stop, the Contractor shall notify Folsom Stage Line (FSL) via the Folsom Public Works Department at 355-7272, forty-eight (48) hours in advance of beginning that portion of the Work and make provisions agreeable to FSL to provide an alternate location where people can safely board the bus.



Section 10.07. Barricading Open Trenches.

Any excavation permitted by the City to be left open shall be barricaded with Type II or Type III barricades with flashers. Signs stating "OPEN TRENCH" shall be posted when requested by the City. All open excavated areas shall be barricaded with at least two (2) Type III barricades at the end of the excavation that faces oncoming traffic. Any excavation within four feet (4') of the traveled way, not protected by K-rail or a similar traffic control barrier approved by the City, shall be backfilled at the end of the work shift or plated in accordance with Section 10.06(G), "Temporary Bridging of Excavations and Trenches", of these General Provisions.

Section 10.08. Existing Utilities.

A. General.

The Contractor shall coordinate and fully cooperate with the City and utility owners for the location, relocation, and protection of utilities. The Contractor's attention is directed to the existence of utilities, underground and overhead, necessary for all buildings in the work area. The Contractor shall arrange with utility owners for the location of service lines in advance of the actual construction and for the relocation of such facilities, if necessary, by the utility owner or the Contractor.

B. Maintenance and Protection.

Unless otherwise shown or specified in the Contract, the Contractor shall maintain in service all drainage, water, gas, sewer lines, power, lighting, telephone conduits, and any other surface or subsurface utility structure that may be affected by the Work. However, the Contractor, for convenience, may arrange with individual owners to temporarily disconnect service lines of other facilities along the line of the Work. The cost of disconnecting and restoring such utilities shall be borne by the Contractor.

Unless otherwise specified in the Special Provisions, the Contractor shall protect all existing utilities on all projects being constructed, whether inside or outside of highway rights-of-way. The utility owner in these cases may elect to provide the necessary protective measures and bill the Contractor for the cost. "Existing utilities" further includes traffic control devices, conduits, streetlights, and related appurtenances.

Existing utility facilities that are to be relocated, including traffic signals and light poles, shall be relocated prior to paving. No paving shall be performed around existing utility facilities that are to be relocated.

The public utility, where it is the owner, shall have the sole discretion to perform repairs or relocation work, or to permit the Contractor to do such repairs or relocation work.

C. Exact Locations Unknown.

It is recognized by the City and the Contractor that the location of existing utility facilities shown on the Contract Drawings and Specifications are approximate and that their exact locations are unknown. Recognition is given to the fact that there may be additional utilities existing on the property unknown to either party to the Contract. Location of utilities as shown on the Contract Drawings and Specifications represent the best information obtainable from utility maps and other information furnished by the various utility owners involved. The City warrants neither the accuracy nor the extent of actual installations as shown on the Contract Drawings and/or Specifications

Because of this uncertainty, it may become necessary for the Engineer to make adjustments in the line or grade of sewers or storm drains. Installation of such adjusted lines shall be made at the regular unit price bid for the work, and no additional compensation will be paid therefore, unless the scope and character of the work has been changed.

In accordance with Government Code section 4215, the City shall make provisions to compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, removing, relocating or protecting existing main or trunk line utility facilities not indicated in the Contract Drawings and Specifications with reasonable accuracy, and for equipment on the Project necessarily idled during such work. In no event shall the City be liable for any further or additional costs resulting directly or indirectly from any such occurrence. Compensation will be in accordance with Article 9, "Changes and Claims", of the General Provisions of the City's Standard Specifications, and in accordance with Section 8-1.09 of the State Specifications. Nothing herein shall be deemed to require the City to indicate the presence of existing utility services, laterals, or appurtenances whenever their presence can be inferred from other visible facilities such as buildings, meters, junction boxes, valves, service facilities, identification markings, and other indicators on or adjacent to the Work.

If the Contractor discovers utilities not identified in the Contract Drawings or Specifications, the Contractor shall immediately notify the Engineer and the utility owner by the most expeditious means available and later confirm in writing.

If the completion of the Work is delayed by failure of the City or the utility owner to remove, repair, or relocate the utility, such delay may be an excusable delay as defined and provided for in Article 7, Section 7.15 of the General Provisions of the City's Standard Specifications. Nothing herein shall preclude the City from pursuing any appropriate remedy against the utility for delays that are the responsibility of the utility. The Contractor, on a street, road, channel or pipeline construction project shall not be assessed liquidated damages for delay in completion of the project for that portion of such delay as is caused by failure of the City or the owner of a utility to provide for the removal or relocation of existing utilities.

#### D. Underground Service Alert (USA).

The City is a member of the Underground Service Alert (U.S.A.) one-call program. Except in an emergency, the Contractor and any Subcontractor planning to conduct any excavation shall notify the U.S.A. at least two (2) Working Days, but no earlier than fourteen (14) Calendar Days, in advance of performing excavation work. U.S.A. can be reached by calling the toll free number – 800-227-2600. U.S.A. does not accept emergency calls. The provisions of Government Code section 4216 shall be followed.

Each phase of a project shall be called into U.S.A. and continuing excavation reported every fourteen (14) Calendar Days. The U.S.A. will provide an inquiry identification number to the person contacting the center. The U.S.A. inquiry identification number shall be available to the Project Inspector at the job site along with the date U.S.A. was called. If the U.S.A. notifications are not kept up-to-date, the excavation may be stopped and a new forty-eight (48) hour notice will be required before continuing the excavation. If, at any time during an excavation for which there is a valid inquiry identification number, the field markings are no longer reasonably visible, the Contractor shall contact

the appropriate U.S.A. notification center to have the area re-marked.

Prior to calling U.S.A., the Contractor shall clearly mark the excavation site with white, water-soluble paint in paved areas or flags, stakes, whickers, or some other approved method, in unpaved areas. This paint shall be applied as white dots located inside the excavated area so that when construction is completed there will be no remnants of the paint. At those locations where the excavation is not known, the Contractor shall make an attempt to closely identify and outline the areas to be explored. The Contractor shall determine the exact location (twenty-four inches (24") from outside edge on either side of the facility) of utilities in conflict with the proposed excavation by exposing the subsurface installation with hand tools before using any power-operated or power-driven equipment. The Contractor shall not call in to U.S.A. the entire project boundaries or, on road construction projects, the entire length of the project. The Contractor shall only request the marking of facilities within the area to be excavated within fourteen (14) Calendar Days of the call.

E. Damage to Existing Utilities.

The Contractor shall notify the affected utility of any contact, scrape, dent, nick, or damage to their facility. Any operator or excavator who negligently violates Government Code section 4215 is subject to a civil penalty in an amount not to exceed ten thousand dollars (\$10,000). Any operator or excavator who knowingly and willfully violates Government Code section 4214 is subject to a civil penalty in an amount not to exceed fifty thousand dollars (\$50,000).

Markings.

The following table designates color codes and symbols that shall be used by the Contractor and the utility owners to identify utilities.

FIELD MARKINGS COLOR CODES AND SYMBOLS		
COLOR	SYMBOL	NAME
Safety Precaution Blue	W	Water
Safety Alert Orange	FA	Fire Alarm
	Tel	Telephone/Communication
	R	Railroad
	TV	Television/CATV
	WU	Western Union
Safety Green	S	Sewer
	D	Storm Drain
Safety Red	L	Street Lighting
	E	Electric
	T	Traffic Signals
High Visibility Safety Yellow	G	Gas
	Company Name	Oil or Chemical Steam
Purple	RW	Reclaimed Water
Pink/Fuchsia	TSM	Temporary Survey
White	USA	Proposed Excavation – Paint outline of proposed excavation area with white dotted line

#### Section 10.09. Excavation and Trench Safety.

##### A. Permit.

The Contractor must obtain a permit from the Division of Industrial Relations per Labor Code Section 6500, as specified in California Code of Regulations, Title 8, Article 6, Section 1539 "Permits" of the Construction Safety Orders, for all excavations five feet (5') or deeper to which an employee is required to descend. The permit shall be kept at the construction site at all times.

##### B. Shoring, Bracing, Shielding and Sheet piling.

In accordance with Labor Code Section 6705, at least five (5) Working Days in advance of excavation of any trench or trenches five feet (5') or more in depth, with a total value of twenty-five thousand dollars (\$25,000) or more, the Contractor shall submit to the City a detailed plan showing the design of shoring, bracing, sloping, or other provisions for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards, the plan shall be prepared by a California registered civil or structural engineer. A signed copy of the detailed plan shall be on the site at the time of the excavation. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the City or any of its employees. These systems must support the sides of the excavation and prevent soil movement that could cause injury to any person or structure. Any damage resulting from a lack of adequate shoring, bracing, shielding or sheet piling shall be repaired at the Contractor's expense.

The Contractor shall immediately replace or repair any unsafe ladder, scaffolding, shoring, or bracing, or correct any other dangerous or hazardous situation that exists.

A Competent Person, as defined in California Code of Regulations, Title 8, Construction Safety Orders, Section 1504, "Definitions", shall be on site at all times when the Contractor's employees are working within the trench. A "Competent Person" is one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measure to eliminate them.

The price bid for work that will require an excavation of five feet (5') or deeper (or less if conditions warrant) shall include the cost of adequate sheet piling, shoring and bracing, or equivalent method conforming to applicable safety orders, unless a separate bid item for such work is included in the bid form.

#### Section 10.10. Preservation of Property.

Roadside and/or on-site trees and shrubbery that are to remain, pole lines, fences, signs, traffic control devices, striping, survey markers and monuments, buildings and structures, conduits, under or above ground pipelines, and any other improvements and facilities shall be protected from injury or damage. If such objects are injured or damaged by reason of the Contractor's operations, said objects shall be replaced or restored at the Contractor's expense to a condition as good as when the Contractor entered upon the Work. The Contractor shall receive the Engineer's approval before the removal of any road sign or permanent traffic control device that interferes with the Work.

## ARTICLE 11. CULTURAL RESOURCES

### Section 11.01. Responsibility.

In the event cultural resources are discovered during subsurface excavations at locations of the work, the Contractor shall cease all construction operations at the location of such cultural resource find until such time that a qualified archeologist can be called to assess the value of these resources and make recommendations to the State Historic Preservation Officer for further direction. If the State Historic Preservation Officer or the Engineer directs the work be temporarily ceased at the location of the cultural find the Contractor shall temporarily suspend the work at the location.

### Section 11.02. Controlling Operation.

If the Engineer or the State Historic Preservation Officer directs that the work be temporarily suspended for cultural purposes on a portion of the work which is the current controlling operation or operations on the Contract, the total number of days for which the suspension is in effect shall be added to the number of allowable contract days in computing the total number of allowable contract days.

### Section 11.03. Non-Controlling Operation.

If a portion of the work at the time of such suspension is not a controlling operation, but subsequently does become the current controlling operation, the determining of contract time will be made on the basis of the current controlling operation or operations.

### Section 11.04. Compensation Determination.

If, as a result of a temporary suspension of the work at a location or locations, the Contractor sustains a loss which could not have been avoided by his judicious handling of forces, equipment, and plant, to perform other work on the contract, there shall be paid to the Contractor such amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor's actual loss, as, in the opinion of the Engineer, was unavoidable, to be determined as follows:

Compensation for idle time of equipment will be determined in the same manner as determinations are made for equipment used in the performance of extra work paid for on a force account basis, with the following exceptions:

- A. The right of way delay factor for each classification of equipment shown in the State of California Department of Transportation publication entitled "Labor Surcharge Equipment Rental Rates" will be applied to such equipment rental rate.
- B. The time for which such compensation will be paid will be the actual normal working time during which such delay condition exists, but in no case will exceed eight (8) hours in any one day.
- C. The days for which compensation will be paid shall be for all or portion of calendar days, excluding Saturdays, Sundays, and legal holidays, during the existence of such delay.

Actual loss shall be understood to include no items of expense other than idle time of equipment and necessary payments for idle time of men and the cost of extra moving of equipment. Compensation for idle time of equipment will be determined by the Engineer

and compensation for idle time of men will be determined by the Engineer as "Labor", and no markup will be added in either case for overhead or profit. Compensation for the cost of moving equipment shall be the actual cost without markup for overhead or profit.

## ARTICLE 12. PROTECTION OF EXISTING TREES

### Section 12.01. Protection of Existing Trees.

Protection of existing trees not authorized for removal shall be given special attention. The Contractor shall comply with the provisions of the City's Tree Preservation Ordinance. Every reasonable effort shall be made to avoid creating conditions adverse to the tree's health. The natural ground within the dripline of saved and protected trees shall remain as undisturbed as possible.

- A. Prior to initiating project construction, in order to avoid damage to the trees and their root systems, Contractor shall install an approved 4' high protective barrier fence completely around any existing tree that is not authorized for removal. The protective fencing shall not be moved or removed without written permission from the City Arborist.
- B. No signs, ropes, cables, or any other items shall be attached to any existing tree that is not authorized for removal, except those cables that may be recommended by a certified arborist for limb support.
- C. No vehicles, construction equipment, mobile home/office, supplies, materials, or facilities shall be driven parked, stockpiled, or located within the dripline of any existing tree that is not authorized for removal.
- D. Grade cuts or fills within the dripline of existing trees not authorized for removal shall not be permitted without authorization from the City, including issuance of an approved tree permit issued by the City Arborist if necessary. Cuts or fills that are necessary beyond the dripline but near the trees shall be contoured to drain away from the tree's dripline.
- E. No trenching whatsoever shall be allowed within the driplines of existing trees not authorized for removal without authorization from the City, including issuance of an approved tree permit issued by the City Arborist if necessary. If it is necessary to install underground utilities within the dripline of an existing tree not authorized for removal, the utility line shall be either bored or drilled. If the boring or drilling is determined to be impossible by the Engineer, the utility line trench may be hand dug under the direct supervision of a certified arborist.
- F. Roots which are approved to be severed or which fall within the structural section of the facility to be constructed shall be cut cleanly and treated with "root sealer" compound and covered with earth as soon as possible. Support roots that are inside the dripline of existing trees not authorized for removal shall be protected. The Contractor is required to hand-dig in the vicinity of major trees to prevent root cutting and mangling which may be caused by heavy equipment. Roots one inch (1") or greater in diameter encountered within the tree's dripline shall not be cut without the Engineer's approval, and shall be kept moist, as approved by the Engineer, and covered with earth within twenty-four (24) hours.
- G. All existing trees on the Site not authorized for removal and which require pruning shall be pruned prior to grading the Site. Native oak trees which require major pruning (branches and/or roots 2 inches in diameter or larger) shall be pruned by an

International Society of Arboriculture certified arborist.

- H. Any tree, regardless of species, that, in the opinion of the City Arborist, is irreparably damaged by the Contractor to the point of affecting the tree's long term health and longevity shall be mitigated for in according to the standards set forth in Folsom Municipal Code Section 12.16.070 – Mitigation.



## ARTICLE 13. CUTTING AND PATCHING

### Section 13.01. Section Includes

A. Execute cutting, fitting or patching of Work, required to:

1. Make parts fit properly.
2. Uncover Work to provide for installation of ill-timed Work.
3. Remove and replace Work not conforming to requirements of Contract Documents.
4. Remove and replace defective Work.
5. Remove samples of installed Work as specified for testing.
6. Remove existing materials (demolition) required prior to installation of specified Work.
7. Uncover Work to provide for Architect's or Consulting Engineer's observation of covered Work.

B. Do not endanger structural integrity of any Work by cutting or altering any part of it.

C. The Contractors with structural responsibility within their scope of Work shall solely execute structural cutting and patching required for this Project.

D. Minor cutting and patching of finishes and/or trim will be performed by the Contractor where required for the execution of its Work. Locations of all cutting and patching (core boring, etc.) shall be reviewed and approved by the Architect or Consulting Engineer prior to the start of Work.

E. The Contractor shall make the field measurements necessary for its Work and be responsible for their accuracy. Also, should any structural difficulties prevent a Contractor from installing its material properly, the Owner's Representative and Architect or Consulting Engineer shall be notified in writing within twenty-four (24) hours. Cutting into the walls, ceilings and floors, if necessary, shall be carefully and neatly performed and then be repaired as specified in the Contract Documents. The Architect or Consulting Engineer shall be consulted prior to the start of Work in all cases where cutting into a structural portion of the building is either desirable or necessary so that satisfactory reinforcement may be provided.

F. Patching of all exposed architectural finishes shall be performed under the supervision of the Project Inspector. Cutting and patching of existing architectural finishes shall be minimized to the extent possible through careful routing and placement of new Work. The Architect, Consulting Engineer or Project Inspector shall have the authority to reject substandard or unacceptable patching.

G. Patching of openings that are cut in any fire rated walls or membranes shall be

sealed tightly using approved materials only. Verify that fire rating envelopes are maintained and inspections provided prior to concealing Work. Cutting and patching, if required by Agencies to verify adequacy of protection after concealment, shall be performed at no cost to the City.

Section 13.02. Related Sections.

- A. Special Provisions.
- B. Article 14 - Alteration Project Procedures.
- C. Article 16 - Quality Control.
- D. Article 17 - Construction Facilities and Temporary Controls.

Section 13.03. Submittals.

- A. Prior to cutting which affects structural safety of Project, submit written notice to Architect or Consulting Engineer requesting consent to proceed with cutting. See items "C" and "E", Section 13.01.
- B. Should conditions of Work or schedule require change of materials or methods, submit written recommendation to Architect or Consulting Engineer, within forty-eight (48) hours, including:
  - 1. Conditions requiring change.
  - 2. Recommendations for alternative materials or methods.
  - 3. Submittals as required for substitutions.
  - 4. Quotations of charges or credits.
- C. Submit forty-eight (48) hour advance written notice to the Architect or Consulting Engineer, with a copy to the Owner's Representative, designating the time Work will be uncovered.
- D. Submit all materials to be used in cutting and patching in accordance with Article 5 of the General Provisions of the City's Standard Specifications.

Section 13.04. Materials.

- A. Primary Products: Materials for replacement of Work removed are to comply with Technical Specifications and are required to match original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution in accordance with Article 5 of the General Provisions of the City's Standard Specifications.

Section 13.05. Examination.

- A. Examine existing conditions prior to commencing Work, including elements subject to movement or damage during cutting and patching.

- B. After uncovering existing Work, examine conditions affecting installation of new products and performance of Work.
- C. Beginning of cutting or patching operations means acceptance of existing conditions.

Section 13.06. Preparation.

- A. Provide means of shoring, bracing and temporary supports as required to maintain structural integrity of the Work.
- B. Provide devices, enclosures and methods to protect adjacent surfaces and areas of the property from damage, dust or disruption.
- C. Provide protection from the elements for areas, which may be exposed during cutting or patching.
- D. Maintain excavations free of water.

Section 13.07. Cutting.

- A. Execute cutting, fitting and adjustment of products to permit finished installation to comply with specified tolerances and finishes.
- B. Perform cutting and demolition by methods, which will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs and new Work.
- C. Uncover Work to install improperly sequenced Work.
- D. Remove and replace defective, rejected or non-conforming Work.
- E. Remove samples of installed Work for testing when requested.
- F. Provide openings in the Work for penetration of Mechanical and Electrical Work.
- G. Employ only experienced installers to perform cutting for weather exposed, moisture resistant and sight-exposed surfaces.
- H. Cut concrete, tile plaster and other rigid materials using masonry/concrete saws and core drills. Pneumatic tools are not allowed without prior approval.

Section 13.08. Patching.

- A. Execute patching to match adjacent Work.
- B. Fit products together to integrate seamlessly with adjacent Work.
- C. Execute patching by methods to avoid damage to adjacent Work, and which will provide appropriate surfaces to receive finishing Work.
- D. Employ only experienced installers to perform patching for weather exposed, moisture resistant and sight-exposed surfaces.

- E. Restore Work with new products in accordance with requirements of the Contract Documents.
- F. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with approved fire rated material in accordance with the manufacturers installation instructions and applicable Codes.
- G. Fit Work to pipes, sleeves, ducts, conduits and other penetrations through affected surfaces neatly and leave in finished condition.
- H. All patched surfaces are to match adjacent finishes in all respects: Type, texture, thickness and color. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit or area.

## ARTICLE 14. ALTERATION PROJECT PROCEDURES

### Section 14.01. Section Includes

- A. Products and installation for patching and extending Work.
- B. Transition and adjustments.
- C. Repair of damaged surfaces, finishes, and cleaning.
- D. Salvage materials.

### Section 14.02. Related Sections.

- A. Article 13 - Cutting and Patching.

### Section 14.03. Alterations, Cutting and Protection.

Assign the work of moving, removal, cutting and patching, to trades qualified to perform the work in manner to cause least damage to each type of work, and provide means of returning surfaces to appearance of new work.

- A. Perform cutting and removal work to remove minimum necessary, and in a manner to avoid damage to adjacent work.
- B. Cut finish surfaces such as concrete, masonry, drywall, plaster or metals, by methods to terminate surfaces in a straight line at a natural point of division, or where indicated.
- C. Protect existing finishes, equipment, and adjacent work, which are scheduled to remain, from damage.
- D. Protect existing and new work from extremes of temperature.
  - 1. Maintain existing Interior work above 60 degrees F.
  - 2. Provide heat and humidity control as needed to prevent damage to remaining existing work and to new work.
- E. Provide temporary enclosures to separate work areas from existing building rooms/office spaces and from areas occupied by the City, whether for storage or human occupation. Temporary enclosures shall be suitable for preventing dust, over-spray and odors from penetrating areas occupied by the City. Failure to adequately protect existing improvements, causing cleaning shall be at the Contractor's expense.

Section 14.04. Products for Patching and Extending Work.

- A. New Materials. As specified in product sections; match new materials to existing work.
  - 1. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work.
  - 2. Presence of a product, finish, or type of construction, requires that patching, extending or matching shall be performed consistent to, or better than, existing standards of quality.
- B. Type and Quality of Existing Products: Determine by inspection and testing existing products where necessary, referring to existing Work as a standard.

Section 14.05. Examination.

- A. Verify that demolition is complete, and areas are ready for installation of new Work.
- B. Beginning of restoration Work means acceptance of existing conditions.

Section 14.06. Preparation.

- A. Cut, move, or remove items as necessary for access to alterations and/or renovation Work. Replace and restore at completion. The full extent of cutting and patching is not shown or specified. The Contractor shall perform all cutting and patching as required.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- C. Remove debris and abandoned items from area and from concealed spaces and dispose of properly and legally.
- D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

Section 14.07. Installation.

- A. Coordinate work of alterations and renovations to expedite completion and to accommodate City occupancy. Patch and extend existing work using skilled mechanics that are capable of matching existing quality of workmanship. Quality of patched or extended work shall be not less than that Specified for new work.
- B. Room Finishes. Complete in all respects consistent with the Contract Documents.
- C. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to specified condition.
- D. Install Products as specified in individual sections.

Section 14.08. Transitions.

- A. Where new work abuts or aligns with existing, perform a smooth and even transition.
- B. Patch Work to match existing adjacent Work in texture and appearance, without breaks, steps or bulkheads.
- C. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.

Section 14.09. Adjustments.

- A. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition.
- B. Where extreme change of plane of two inches or more occurs, request Instructions from Architect or Consulting Engineer as to method of making transition.
- C. Trim existing doors as necessary to clear new threshold Installation. Refinish trim as required.
- D. Fit work at penetrations of surfaces as shown on Drawings.

Section 14.10. Salvaged Materials.

- A. Salvaged Materials from existing facilities, which are specified in the Special Provisions or tagged in the field prior to the pre-bid walk-through to be salvaged, shall remain the property of the City. The Contractor shall include the removal, disassembly, preparation, marking, bundling, packaging, tagging, hauling, and stockpiling of salvaged materials or facilities to the location specified in the Special Provisions, or as directed by the Owner's Representative. Materials include parts, articles, and equipment of assembled facilities. Salvaging does not include the preparation of existing material that is to be reused in the work.
- B. When only specific materials from the facility are designated to be salvaged, the remaining materials from that facility shall be removed and disposed of as provided for elsewhere in the Contract Documents. Materials to be salvaged shall not be removed until their use in the existing facility is no longer required, as determined by the Owner's Representative.
- C. When practicable, salvaged materials shall be hauled directly to the location specified in the Special Provisions and stockpiled; however, salvaged materials may be temporarily stored at a location selected by the Contractor and approved by the Owner's Representative and later hauled to and stockpiled at their final location. Materials which are lost before stockpiling at their final location shall either be replaced by the Contractor, at the Contractor's expense, or, at the discretion of the Owner's Representative, the estimated cost of replacement may be deducted from any moneys due or to become due to the Contractor.
- D. Materials designated to be salvaged that are damaged, as determined by the Owner's Representative, shall be segregated from undamaged material. After review of the damaged materials by the Owner's Representative, all damaged

materials that are rejected by the Owner's Representative shall become the property of the Contractor and shall be disposed of as provided elsewhere in the Contract Documents.

- E. Materials to be salvaged that are damaged as a result of the Contractor's operations shall be repaired by the Contractor, at the Contractor's expense, to the satisfaction of the Owner's Representative. Materials that are damaged beyond repair as a result of the Contractor's operations shall be disposed of as provided elsewhere in the Contract Documents and replaced at the Contractor's expense; or, at the discretion of the Owner's Representative, the estimated cost of replacement may be deducted from any moneys due or to become due to the Contractor.
- F. Replacements for lost or damaged materials shall be of the same kind and of the same or better quality and condition as the lost or damaged materials were prior to their removal. Replacement materials should also be of the same size, color, weight etc. of the original materials. Matching or exceeding quality and condition alone may not permit the reuse of material.

Section 14.11. Repair of Damages Surfaces.

- A. Patch or replace portions of existing surfaces, which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.

Section 14.12. Finishes.

- A. Finish surfaces as specified in individual product sections.
- B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest Intersections.
- C. Unless otherwise specified or shown, subsurface shall be prepared as recommended by finish material manufacturers for project conditions for the proper application of new finishes.

Section 14.13. Cleaning.

- A. Clean adjacent Owner occupied areas of work soiled by work of this Contract.



## ARTICLE 15. PROJECT MEETINGS & PROCEDURES

### Section 15.01. Section Includes

- A. The Owner's Representative will schedule and administer a preconstruction meeting, regular progress meetings, and specially called meetings throughout progress of the Work, and will:
  - 1. Prepare agenda for meetings.
  - 2. Make physical arrangements for meetings.
  - 3. Preside at meetings.
  - 4. Record the minutes; include significant proceedings and decisions.
  - 5. Reproduce and distribute copies of minutes after each meeting to participants in the meeting and to parties affected by decisions made at meeting.
- B. Representatives of the Contractor, Subcontractors and suppliers attending meetings shall be experienced supervisory staff with written authorization to act on behalf of the entity each represents.

### Section 15.02. Preconstruction Meeting.

- A. Timing: Prior to start of construction.
- B. Attendance: Architect or Consulting Engineer and consultants as appropriate, Owner's Representative, Contractors as requested.
- C. Purpose: Discuss and familiarize Contractors with construction administrative procedures to be used on Project.

### Section 15.03. Progress Meetings.

- A. Timing: Frequency, day and time to be determined by the Owner's Representative, Architect or Consulting Engineer and the City.
- B. Attendance: Owner's Representative and each Contractor on site; Architect or Consulting Engineer, consultants, and Subcontractors when required.
- C. Purpose: To provide a formal and regular forum for the City, the Owner's Representative, Architect/Engineer, Contractor and Subcontractors to present questions, problems or issues that need to be addressed. It will also provide an opportunity to review the progress on previous issues and action items along with submittal and schedule review.

### Section 15.04. Specially Called Meetings.

- A. The Owner's Representative may call a special meeting at any time during the course of the Project. Special Project meetings shall include representatives of the Project as requested in order to discuss problems and/or solutions that are common to the Project.

## ARTICLE 16 - QUALITY CONTROL

### Section 16.01. Section Includes

- A. Quality assurance and control of installation.
- B. References.
- C. Field samples.
- D. Mock-up.
- E. Inspection and testing laboratory services.
- F. Manufacturers' field services and reports.

### Section 16.02. Related Sections.

- A. General Provisions and Special Provisions - Submittals
- B. Technical Specifications

### Section 16.03. Quality Assurance/Control of Installation.

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect or Consulting Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
- G. Contractor's Line of Authority: The Contractor shall provide one person who shall be both knowledgeable and responsible for all work to be performed on this Project. In the Contractor's absence, the Contractor's appointed representative shall be responsible for all directions given him/her and said directions shall be binding as if given to the Contractor. The Contractor's representative shall be responsible to coordinate all work to be performed.
- H. Shop and fieldwork shall be performed by mechanics skilled and experienced in the fabrication and installation of the work involved. All work on this Project shall be

done in accordance with the best practices of the various trades involved and in accordance with the drawings, approved shop drawings and these specifications.

- I. All work shall be erected and installed plumb, level, square and true and in proper alignment and relationship to the work of other trades. All finished work shall be free from defects. The City reserves the right to reject any materials and workmanship which are not considered to be up to the highest standards of the various trades involved. Such inferior material or workmanship shall be replaced by the Contractor at no additional cost to the City and without an extension of the Contract Time.
- J. All work shall be installed by a knowledgeable contractor and defined "certified to install" by the specified materials manufacturers. The specifications and recommendations of the manufacturer whose materials are used shall be strictly adhered to during the application or installation of materials.
- K. Any additional work beyond that specified or illustrated, or any modification thereto, that is necessary for the furnishing of guarantee shall be provided by the Contractor without additional cost to the City.

#### Section 16.04. References.

- A. Conform to reference standards by date of issue current on date of the Contract Documents.
- B. Should specified reference standards conflict with Contract Documents, request clarification from Architect or Consulting Engineer before proceeding.
- C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- D. The Contractor shall be responsible for being current and knowledgeable of all building codes involved for all trades under its direction.

#### Section 16.05. Field Samples.

- A. Install field samples at the Site as required by individual specification sections for review.
- B. Acceptable samples represent a quality level for the Work.
- C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Architect or Consulting Engineer.

#### Section 16.06. Mock- Up.

- A. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.
- B. Where mock-up is specified in individual sections to be removed, clear area after mock-up has been accepted by Architect or Consulting Engineer.

Section 16.07. Manufacturers' Field Services and Reports.

- A. Submit qualifications of observer to Architect or Consulting Engineer thirty (30) Calendar Days in advance of required observations.
- B. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.
- C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Submit report in duplicate within thirty (30) Calendar Days of observation to Architect for review.

## ARTICLE 17. TEMPORARY FACILITIES AND CONTROLS

### Section 17.01. Work Included

Temporary Facilities and controls required for this Work include, but are not necessarily limited to:

- A. Temporary water, power, light, heat and Project Identification Sign.
- B. Field office and associated telephone and utilities.
- C. Temporary weather protection.
- D. Parking and storage areas.
- E. Site fencing and security.
- F. Sanitary facilities.
- G. Dewatering.
- H. Emergency power and water shut-off.

### Section 17.02. Project Identification Sign

Unless otherwise provided in the Special Provisions, the Contractor shall provide and install one eight foot by four foot (8' x 4') Project Identification Sign. The City shall establish the location for the Sign. The Sign shall be fabricated from exterior grade, 5/8" plywood with four inches by four inches (4" x 4") posts of sufficient length to provide appropriate and sage sign height for its location and soil embedment. The Sign shall be prepared by a professional sign manufacturer and shall include an opaque white background, opaque white posts, die-cut fabricated lettering with no more than two (2) letter fonts, and no more than two (2) letter colors. The Contractor shall provide an eight and one-half inch by eleven inch (8.5" x 11") mock-up of the Sign for approval by the City prior to fabrication. List the title of the Project, names of City of Folsom, architectural/engineering firm, Contractor and major Subcontractors. The Contractor shall allow no other signs to be displayed on the Project site.

### Section 17.03. Temporary Utilities.

General: Charges for the use of utility services other than those associated with individual field offices or planned electrical service interruptions will be paid for by the City. The Contractor shall provide temporary heating, or ventilating, or cooling when permanent services are interrupted due to performance of the Work. The Contractor shall provide temporary means of operation for existing storm, water, sewer, gas, mechanical, electrical, and low voltage systems during construction. Any planned interruption of permanent services, facilities, or operations must be coordinated and approved in advance with the Owner's Representative.

#### A. Temporary Power.

The Contractor shall construct all temporary power facilities required to complete the Work and maintain in accordance with Division of Industrial Safety "Electrical Safety Orders" (ESO), Public Utilities Commission "Rules of Overhead Line Construction" (G.O. 95), and Cal-OSHA. Materials, devices and equipment used for these facilities shall be in good and safe condition but need not be new. The Contractor is responsible for the

removal of the temporary power. Existing electric outlets may be utilized, if permitted by the City and authorized by the Owner's Representative. Any additional power required shall be provided and paid for by the Contractor.

B. Temporary Lighting.

The Contractor shall provide, maintain, and remove temporary lighting necessary to complete the Work.

C. Temporary Heat.

The Contractor shall provide, maintain, and remove temporary heat necessary to complete the Work.

D. Temporary Water.

The Contractor shall provide sufficient hoses to carry water to every required part of construction and allow use of water facilities to Subcontractors engaged in the Work. The Contractor is also responsible for the removal of the temporary water. Existing water outlets may be utilized, except that no water may be drawn from fire hydrants without prior written approval of the City for such a connection. Any additional water required beyond that available from existing water outlets and/or as approved by the City shall be provided by the Contractor.

E. Temporary Telephone.

The Contractor shall provide its own telephone system. Use of City telephones will not be allowed.

F. Temporary Fire Protection.

The Contractor shall provide and maintain fire extinguishers and first aid kits in accordance with Cal-OSHA and federal requirements to be used in the event of an emergency.

G. Temporary Weather Protection.

The Contractor shall provide and maintain protection measures to ensure that damage(s) will not occur to City property during course of construction.

H. Temporary Dewatering.

The Contractor shall provide and maintain a dewatering system as required to perform its work. This temporary dewatering system may, and should, be reviewed by the Architect or Consulting Engineer and/or the Owner's Representative.

Section 17.04. Field Office/Storage Containers.

If desired, the Contractor may provide a temporary field office(s) or storage container(s). Locate field office(s)/storage container(s) consistent with the City's Standard Specifications and as directed by the Owner's Representative. Upon completion of Work, Contractor shall remove any and all temporary field office(s) and storage container(s).

Section 17.05. Parking of Vehicles.

The Contractor shall assume all responsibility for job site vehicle parking of its and its Subcontractors' vehicles. Locations of parking shall be as directed by the Owner's Representative. The Project Site may not accommodate on-site parking of construction personnel vehicles. The Contractor shall assure compliance with all applicable requirements for

on-street vehicle parking.

Section 17.06. Storage and Laydown Areas.

Only areas designated by the City can be used by the Contractor for laydown areas. The Contractor is responsible for providing its own fenced storage facilities (trailers or cargo containers). The use of storage and laydown areas shall be consistent with the provisions of the City's Standard Specifications.

Section 17.07. Temporary Site Fencing and Security.

The Contractor shall provide and maintain temporary fencing surrounding the buildings and/or areas under construction, and staging areas. The Contractor is responsible for the security of all equipment, material, and completed construction items. The Contractor is also responsible for securing any breeches to existing security system/buildings caused by its Work. Temporary measures may include watchman, temporary doors, temporary alarm, etc.

Section 17.08. Sanitary Facilities.

The necessary sanitary conveniences for the use of the workers on the project, properly obscured from public observance, shall be constructed and maintained by the Contractor in such manner and at such points as shall be approved by the Engineer, and their use shall be strictly enforced.

Section 17.09. Temporary Construction, Equipment and Protection.

Contractor shall provide, maintain and remove upon completion of Work, all temporary rigging, scaffolding, hoisting equipment, rubbish chutes, ladders, barricades, lights and all other protective structures or devices necessary for safety of workers and public property as required to complete the Work.

Safety: The contractor is responsible for the complete safety of City personnel, consultants, and the general public at all times.

Protection: The Contractor must protect all workers and equipment from power lines by maintaining safe distances and by providing protective devices where and as required by Industrial Safety Commission and Cal-OSHA.

Temporary construction and equipment: All temporary construction and equipment shall conform to all regulations, ordinances, laws and other requirements of the State of California and any other authorities having jurisdiction (including insurance companies), with regards to safety precautions, operations and fire hazards.

## ARTICLE 18 – OPERATIONS AND MAINTENANCE DATA

### Section 18.01. Qualified Personnel.

The Contractor shall insure that personnel experienced in maintenance and operation of described products prepare instructions and data.

### Section 18.02. Format and Required Information for Instructions and Data.

Unless otherwise provided in the Special Provisions, the Contractor shall prepare data in the form of an instructional manual (Operations and Maintenance Manual) including, at a minimum, the following information:

- Drawings
- Illustrations
- Parts lists
- Wiring diagrams of systems
- Internal wiring diagrams and circuit board schematics and layout drawings
- Manufacturer's recommended spare parts lists
- Name, address and phone number of nearest parts and service agency
- Systems balance data
- Maintenance and service instructions
- Operation instructions
- Software including annotated source lists and programs

The data shall be presented to the following standards:

- A. Binders: Commercial quality, 8 and one-half inch by eleven inch (8.5" x 11") three-ring binders with hardback, cleanable, plastic covers; four inch (4") maximum rings size; when multiple binders are used, correlate data into related construction groupings.
- B. Cover: Identify each binder with typed or printed title "OPERATION AND MAINTENANCE INSTRUCTIONS"; list title of Project; identify subject matter of contents.
- C. Arrangement: Arrange content by systems, under specification section numbers; provide tabbed section divider for each separate product and system, with typed description of product and major component parts of equipment.
- D. Text: Manufacturer's printed data, or typewritten data on 20-pound paper as required to supplement product data. Provide logical sequence of instruction for each procedure, incorporating manufacturer's instructions.
- E. Drawings:
  - 1. Provide with reinforced punched binder tab.
  - 2. Bind in with text; fold larger drawings to size of text pages.
  - 3. Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.



4. DO NOT use Project Record Documents as maintenance drawings.

- F. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of design consultants and Contractor with name(s) of responsible parties; schedule of products and systems, indexed to content of volume.
- G. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- H. Product Data: Mark each sheet to clearly identify specific products, component parts and data applicable to installation; delete inapplicable information.
- I. Warranties: Bind in copy of each.

Section 18.03. Additional Information.

In addition to the requirement to submit additional information as set forth in Section 18.04, the Contractor shall provide the following additional information:

- A. Instructions for Care and Maintenance to include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- B. Operating procedures for equipment and systems to include start-up, break-in, routing and normal operating instructions and sequences; include regulation, control, stopping, shut-down, and emergency instructions; include summer, winter, and any special operating instructions.
- C. Maintenance requirements to include routing procedures and guide for trouble-shooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

Section 18.04. Training.

Before final inspection, the Contractor shall instruct the City's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems at agreed upon times.

For equipment requiring seasonal operation, perform instructions for other seasons within six (6) months.

The Contractor shall instruct City personnel using the Operations and Maintenance Manuals as the basis for instruction and shall review the contents of the Manuals with City personnel in detail to explain all aspects of operation and maintenance.

The Contractor shall prepare and insert additional data in Operations and Maintenance Manuals when the need for such data becomes apparent during instruction.

Section 18.05. Submission of the Operations and Maintenance Manuals.

The Contractor shall submit two copies of preliminary draft Operations and Maintenance Manuals for review by the City as soon as possible.

The Contractor shall submit one copy of completed Operations and Maintenance Manuals in final form fifteen (15) Calendar Days prior to final inspection. The copy will be returned after final inspection with the City's comments. The Contractor shall review the content of the Operations and Maintenance Manuals as required prior to final submittal to the City.

The Contractor shall submit two copies of revised Operations and Maintenance Manuals in final form within ten (10) Calendar Days after final inspection.

## **SPECIAL PROVISIONS**

## **SPECIAL PROVISIONS**

### **SP-1 SCOPE AND LOCATION OF WORK**

The project location is in Sacramento County. The Folsom Water Treatment Plant (WTP) is located at 194 Randall Drive, Folsom CA 95630.

- A. The WORK to be performed under this Contract shall consist of furnishing all plant, tools, equipment, materials, supplies, and manufactured articles and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all Work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The Work shall be complete, and all Work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the Work in good faith shall be provided by the Contractor as though originally so indicated, at no increase in cost to the Owner.
- B. The City of Folsom WTP, which is owned and operated by the City, is a conventional plant that treats surface water from the American River water supply stored in Folsom Lake. The plant provides drinking water to approximately 73,106 residents, excluding the population of Folsom State Prison, over a 24 square mile area and is designed to produce 50 million gallons per day (mgd) of treated drinking water. The Project consists of improvements to the existing reclaimed backwash system as indicated in the Contract Documents.
- C. A summary of Work provided below is for informational purposes only, and is not all inclusive:
  - Folsom WTP Backwash and Recycled Water Capacity Project:
    - Demolition of three existing submersible decant pumps
    - Installation of three new submersible decant pumps
    - Replacement of piping, influent shear/slide gates, valves, and other appurtenances for the Decant pump station.
    - Installation of approximately 175 linear feet of 36" welded steel RBW pipe and valves.
    - Temporary bypass pumping substituting for the Decant pump station and temporary water barrier in the Reclamation Backwash Basin (RBB).
    - Miscellaneous civil sitework including AC pavement and concrete replacement associated with the Work.
    - Associated Electrical, Instrumentation and Controls

## SP-2 MEASUREMENT AND PAYMENT

### A. Scope:

- i. Measurement and payment shall be made in accordance with Article 8. Measurement and Payment of the City of Folsom General Provisions. Payment for various items of the Bid Schedule as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies and manufactured articles, for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs for the construction of the work specified and shown therefore shall be included in the prices listed in the Bid Schedule for the various items of work.
- ii. Payment for lump sum items shall be made for the completed work on a percentage basis, as determined by the Owner's Representative or each with the full amount to be paid to the Contractor upon completion of the work as specified and shown. Submit a breakdown for each lump sum bid item at the Pre-Construction Conference showing the amount included for each principal category of work, in sufficient detail to provide a basis for determining progress payments. The breakdown shall separately include costs for labor, materials, equipment, subcontracts, fixed cost elements, incidental expenses and a proportionate share of the overhead and profit. Revise and resubmit breakdowns as requested by the Owner's Representative.
- iii. Payment for unit price items shall be as determined from the Owner's Representative's records of the quantities of work completed each month times the unit price established in the Bid Schedule.

### B. Definitions of Bid Quantities

- i. Lump Sum (LS) – The bid amount for performing all related and/or required work to complete item in question.
- ii. Linear Foot (LF) – The distance measured horizontally along the ground surface to determine the length of work performed.
- iii. Square Foot (SF) – The surface area or an item of work measured in its final placed condition.
- iv. Each (EA) – The bid amount for performing all related or required work to construct one complete work item as specified and shown on plans.

### C. Description of Bid Items

1. Item 1, Mobilization and Demobilization (Lump Sum) - See General Provisions Section 8.02, paragraph C.
2. Item 2, Shoring (Lump Sum) - This item includes all work including materials, equipment and labor as required for sheeting, shoring, and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation, which shall conform to applicable safety orders per Section 6707 of the California Labor Code.
3. Item 3, 36-inch RBW piping (Lump Sum) - This item includes all work including materials, equipment and labor as required for furnishing, excavation, installation, testing, and backfill of 36-inch RBW piping, valves, fittings, and related appurtenances as shown in the contract drawings.
4. Item 4, Decant pump station upgrades (Lump Sum) - This item includes all work including materials, equipment, and labor as required for the demolition, furnishing, installation, and testing of the Decant pump station submersible pumps, piping, valves, gates, and related appurtenances. This item shall also include all work including materials, equipment and labor as required for the excavation, backfill, concrete, and miscellaneous metals work at the Decant pump station.
5. Item 5, Temporary bypass pumping (Lump Sum) - This item includes all work including materials, equipment and labor as required for the temporary bypass pumping and temporary water barrier in the Reclamation Backwash Basin (RBB) to accommodate work in and around the Decant pump station. This item includes all electrical and mechanical work required a fully functional bypass apparatus.
6. Item 6, Site Work (Lump Sum) - This item includes all work including materials, equipment and labor as required for the miscellaneous sitework, grading, and AC paving around the site
7. Item 7, Electrical and Controls (Lump Sum) - This item includes all work including materials, equipment, labor, and integration as required for furnishing and installation of the electrical, instrumentation and controls, including but not limited to wiring, conduits, connections to MCCs, PLCs, VFDs, and LCPs as required and shown in the Contract Documents.

### SP-3 STANDARD SPECIFICATIONS

The City of Folsom Standard Construction Specifications and Standard Construction Details are considered as part of the Contract Documents and are the primary reference for technical specifications for the construction of City projects. Any item of work not specified in the following Technical Specification sections or not shown in the Bid Drawings shall be referred to the City Standards, available at:

<https://folsom.prod.govaccess.org/government/community-development/development-engineering-services/improvement-standards-construction-specifications-and-details>

### SP-4 CONFORMANCE WITH CODES AND STANDARDS

In addition to those listed in the General Provisions (Section 4.06, 6.01), the Contractor will comply with Clean Air Act Section 306, Executive Order 11738, and EPA regulations at 40CFR 15, which prohibits dealing with entities in noncompliance with cited acts.

### SP-5 (NOT USED)

### SP-6 TIME OF COMPLETION

All work done under this Contract shall be completed within **three hundred and sixty-five (365) Calendar Days** from the Notice to Proceed.

No construction work shall occur from May 1<sup>st</sup> through October 1<sup>st</sup>. Shut-downs of the Water Treatment Plant are not permitted during this time. Refer to SP-28 for further construction/time of year constraints.

All work shall occur Monday through Friday. No work on weekends or Legal Holidays will be allowed. Exceptions to the work hour limitations described above are allowed only with the City's written permission. Work hours are between 7:00 AM and 3:30 PM.

### SP-7 LIQUIDATED DAMAGES

In accordance with the General Provisions (Section 7.19), if the work is not completed by the Contractor in the time specified in the Contract Documents it is agreed that the Contractor will pay to the City as fixed and liquidated damages, and not as a penalty, the sum of **\$1,500** for each Calendar Day of delay until the Date of Completion.

### SP-8 PRE-CONSTRUCTION MEETING

Before commencement of construction, a pre-construction meeting will be held with the Contractor, the Contractor's superintendent, the Engineer, and appropriate City representatives to discuss all phases of construction scheduling and operations.

The contractor shall submit the following at the pre-construction meeting:

- a. An overall project schedule clearly indicating all critical path items leading to the specified time of completion.
- b. A one-month detailed schedule showing all pertinent operations including submittals, procurements, and planned construction activities for that month period.
- c. Schedule of Values.
- d. An overall schedule of shop drawings and submittals.
- e. A list of permits to be obtained by the Contractor.
- f. Construction Procedure, Sequence of Operations and Commissioning Plan.
- g. Safety and Accident Response Plan and permit-required confined space policy and procedures.
- h. Submittal for the three new submersible decant pumps. The pumps are to be ordered a maximum of 45 days from the issuance of the notice to proceed and within 7-10 days from the City/Engineer approved submittal review.

#### SP-9 PROGRESS MEETINGS AND SCHEDULES

The Contractor shall schedule and hold regular weekly progress meetings at the City of Folsom Water Treatment Plant. If necessary, additional progress meetings may be necessary at the request of the Contractor or the Engineer.

The Contractor shall furnish agendas and meeting minutes and any updates to the monthly and overall project schedules at the progress meeting. Any significant changes to the overall project schedule identified at the progress meeting shall be reflected in an updated schedule submitted by the following weekly meeting.

The Contractor, Engineer, Site inspector, and any Subcontractors actively working on the project shall attend the weekly progress meeting to discuss progress of the work, and any current or anticipated issues to be addressed, and to assure proper coordination of efforts between all parties involved in the construction and with the public.

#### SP-10 STAGING AREA AND SERVICES

The Contractor is responsible for establishing their own staging area. If the contractor needs more room than the construction area to stage, it is their responsibility to obtain this area. Contractor may at his own discretion identify private property for use as staging area(s). The Contractor shall be responsible for all negotiations with property owners and must secure all permits required for entry and use of said property. Contractor shall submit to the City written documentation verifying approval for use of private property.

The Contractor shall provide and pay for electrical service or generator for all purposes of power and lighting as required for construction Work of the Contract and shall maintain such services until the completion of the Contract. The Contractor shall make arrangements for and shall provide himself with a satisfactory and adequate water supply for the Work under the Contract.



#### SP-11 SURVEYS

Survey data shown on the plans is based on the project benchmarks shown on the Drawings. The City will not furnish any surveys. It is the Contractor's responsibility to establish all grades, lines, levels, and benchmarks required for the project. Contractor shall match existing elevations. Verify all grades, lines, levels, and dimensions as indicated on the Drawings and report any errors or inconsistencies to Owner's Representative before commencing work.

#### SP-12 (NOT USED)

#### SP-13 DIFFERING SITE CONDITIONS

- A. In the event that site conditions are materially different than shown on the plans, or observable from public right-of-ways during the bidding period, the Contractor shall promptly notify the Owner's Representative in writing. The Owner's Representative shall investigate the conditions, and if he finds that such conditions do materially differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work under this Contract, the Owner's Representative will recommend to the City that an equitable adjustment be made by modifying the Contract by Change Order to account for differing site conditions.
- B. No claim of the Contractor under this clause or any other shall be allowed unless the Contractor has given notice required under A., above.
- C. No claim of the contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

#### SP-14 SALVAGED MATERIALS

No materials are to be salvaged for this project. All removed materials are to be properly disposed of by the Contractor.

#### SP-15 CONSTRUCTION SCHEDULE AND COORDINATION

The Contractor shall submit a construction schedule showing major critical elements of the project, including shop drawing submittals, equipment and material procurement, fabrication, delivery, and any long lead items in construction work.

#### SP-16 HEALTH AND SAFETY

The Contractor shall be solely and completely responsible for conditions of the job site, including health and safety of all persons (including employees, subcontractors, service personnel and site visitors) and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Health

and Safety provisions shall conform to U.S. Safety Orders, Title 8, U.S. Environmental Protection Agency Standard Operations Guides, and all other applicable Federal, State, County and local laws, ordinances, codes and regulations that may be detailed in other parts of these documents. Where any of these are in conflict, the more stringent requirements shall be followed. The Contractor's failure to thoroughly familiarize himself with the aforementioned safety provisions shall not relieve him from compliance with the obligations and penalties set forth herein.

#### SP-17 CLEANUP

The Contractor shall not allow the site of work to become littered with trash and waste material but shall maintain the site of the work in its normal, neat and orderly conditions throughout the construction period. On or before the completion of the work, the Contractor shall remove all rubbish from any area which he has occupied and leave them in first-class condition to the satisfaction of the Project Engineer.

#### SP-18 REFERENCE FORMS

The Contractor shall use the standard proposed Change Order, Request for Information, and Submittal transmittal form provided in the Project Forms section of the Contract Documents.

#### SP-19 SUBMITTALS

- A. The Contractor shall use the Submittal Transmittal form for transmitting all submittals, shop drawings, or other information required for review by Owners' Representative. The procedure governing such submittals is included in the City of Folsom General Provisions, Section 5.10.
- B. Accompany each submittal with a Submittal Transmittal form which contains the following information:
  - i. Contractor's name and the name of Subcontractor or supplier who prepared the submittal.
  - ii. The project name and identifying number.
  - iii. Description of the submittal and reference to the contract provision or specification section and paragraph number being addressed.
  - iv. Statement of whether the Submittal is per specification or is a substitution or deviation.
  - v. Submittals shall be addressed to the Owner's Representative:

**HDR  
2365 Iron Point Road Suite 300  
Folsom, CA 95630**

**with cc to:**  
**Kelsie Gugino**  
**City of Folsom**  
[kgugino@folsom.ca.us](mailto:kgugino@folsom.ca.us)

**and**

**Nathan Stites**  
**City of Folsom**  
[nstites@folsom.ca.us](mailto:nstites@folsom.ca.us)

C. The following is a preliminary list of submittals. The Contractor is responsible for meeting all submittal requirements specified in these Contract Documents.

- i. Initial Contract Schedule (within 7 Calendar Days of NTP)
- ii. Schedule of Values (within 10 Calendar Days of NTP)
- iii. Safety and Accident Response Plan (20 Calendar days prior to commencement of work)
- iv. Emergency Contact Information (20 Calendar days prior to commencement of work)
- v. Pre-Construction, Construction and Post-Construction Photographs (prior to submittal of final pay request)
- vi. Construction sequencing plan for demolition and new construction accounting for project construction and operational constraints as identified in Drawing sheet G04.
- vii. Shop Drawings and/or Product Information for all materials of construction as specified by Contract Documents (within 60 Calendar Days of NTP). Including, but not limited to:
  - a. Temporary bypass pumping system
  - b. Concrete
  - c. Anchorage
  - d. Metal fabrications
  - e. Joint Sealants
  - f. Coatings
  - g. Electrical and Controls
  - h. Earthwork
  - i. Asphalt Paving
  - j. Piping, valves, shear/slide gates
  - k. Submersible pumps
  - l. Startup and Commissioning plan
- viii. Record Drawings (15 Calendar days following substantial completion)
- ix. O&M Manuals
  - a. Manufacturer provided operation and maintenance data and recommendations for all other materials provided.

## SP-20 USE OF CITY STANDARDS

The City of Folsom Standard Technical Specifications and Standard Details (February 2020 edition) are considered as part of the Contract Documents and are the primary reference for technical specifications for the construction of City projects. Any item of work not specified in the following Technical Specification sections or not shown in the Bid Drawings shall be referred to the City Standards or as stated under SP-21.

## SP-21 DOCUMENT PRECEDENT

The component Contract Documents are intended to provide explanation for each other. Any work shown on the Plans and not in the Specifications, or vice versa, is to be executed as if indicated in both. In case of conflict in the Contract the following order of precedence will govern interpretation of the Contract:

1. Field Instructions or other written directives
2. Special Provisions and Project-specific Specifications (Technical Specifications)
3. Project Plans
4. City of Folsom General Conditions
5. City of Folsom Standard Construction Details
6. City of Folsom Standard Construction Specifications
7. Sacramento County Standard Plans
8. Sacramento County Standard Specifications

Any work, for which there are no provisions in these Specifications, the Special Provisions or Technical Specifications, or on the Contract Drawings, shall be performed in accordance with the provisions of the State Specifications.

## SP-22 CONSTRUCTION PHOTOS

The Contractor shall provide pre-construction, during construction and post-construction photos for all aspects of the work performed on the project. If the Contractor does not adequately document pre-construction conditions of all areas of the work, the Contractor will be obligated to restore any disputed private property or public property conditions to the satisfaction of the property owner and the City.

Construction photos shall be color, date stamped, digital images, delivered to the City on a USB drive, CD, or DVD. An index will be provided that clearly relates picture number to location. This format will be discussed further during the Pre-Construction Meeting.

The Contractor may also use video recordings to establish site conditions, however this will not relieve the requirements for construction photos.

Pre-construction photos will be delivered to the Engineer for review prior to beginning construction. Photos during construction should be used to document changes in work from the Contract Documents, repair of existing underground utilities, and any other such useful information. Post-construction photos shall be taken at the same locations as the pre-construction photos for comparison. This will also be the case for the post-construction video recordings.

#### SP-23 AGREEMENTS

The Contractor must obtain written permission from the owner of any privately owned property prior to beginning any work, storing materials, or otherwise conducting any operations on said property. The written approval from the property owner must be on file with the City before any operations will be permitted on said property.

#### SP-24 RECORD DRAWINGS

The Contractor shall record on a set of working drawings provided by the City dimensioned locations of all buried and concealed piping, conduit, valves, stub outs, etc., and shall deliver same to the Owner's Representative upon completion of the job. Refer to General Provisions Section 4.15 for more detailed information. Said drawings shall also show all changes made in actual construction from that shown on the Contract drawings. These drawings shall have all dimensions and corrections shown. The Project Engineer will transfer this information onto a reproducible set of working drawings stamped as "Record Drawing" which will be provided to the City.

Contractor shall keep an updated set of working drawings as noted above and shall present these drawings at the weekly project meeting for review by the Engineer.

#### SP-25 ALLOWABLE TIMES AND HOURS OF WORK

Unless otherwise noted, directed, or approved by the City, no work shall be done between the hours of 5:00 p.m. and 7:00 a.m. except for the shutdown work as specified, or on Saturdays, Sundays, or Legal Holidays. Unless otherwise noted, directed or approved by the City, no lane of traffic shall be closed to the public during the peak hours of 6:30 a.m. to 8:00 a.m. and 3:30 p.m. to 6:00 p.m., except as necessary for the proper care and protection of work already performed or in case of an emergency repair. These exceptions are allowed only with the City's written permission.

#### SP-26 STORM WATER POLLUTION PREVENTION PLAN

The Contractor shall be responsible for development; submittal and implementation of a project specific Storm Water Pollution Prevention Plan (SWPPP) per General Provisions Section 6.08. Contractor must also comply with SWPPP provisions for projects less than 1 acre as outlined in Appendix A.

#### SP-27 FEES AND COST NOT EXPRESSLY PAID FOR BY THE CITY

Bid prices shall include everything necessary for the Completion of the Work and fulfillment of the Contract, including but not limited to furnishing all materials, equipment, tools, excavation, sheeting, bracing and supports, plans, labor and services. Bid prices shall include all Federal, State and local taxes, and all other fees and costs. No fees or costs shall be paid for by the City. See General Provisions Section 2.02.

#### SP-28 CONSTRUCTION PROCEDURE, SEQUENCE OF OPERATIONS, AND COMMISSIONING PLAN

General: The existing Folsom WTP is currently and continuously in use and shall not be interrupted except as specified herein.

1. The Contractor shall coordinate the work to avoid any interference with normal operation of the Folsom WTP.
2. The Contractor shall allow City access to the site for normal operations and shall stop work as required during operational emergencies.
3. The Contractor shall keep the City fully advised as to the plans for carrying out the work and obtain City approval for all phases of construction operations.
4. Covers shall be provided for all open manholes, wet wells, and excavations.
5. Thrust restraints shall be provided for all pressurized flow conditions, including temporary or bypass conditions.
6. Discharge or spill of fuel, oil to surface waters, drainage courses or onto the ground is prohibited.
7. Penalties imposed on the City as a result of any discharge or spill caused by the actions of the Contractor, the Contractor's employees or subcontractors shall be borne in full by the Contractor including any penalties, fines, legal fees and other expenses to the City during construction.
8. At the discretion of the City, the City will have the authority to delay the construction project in the event of any emergencies and/or operations as it relates to the Folsom WTP.
9. Temporary shutdowns of the WTP to tie-in new pipe, electrical services and equipment shall be coordinated with the City.
10. The Contractor shall note that not all valves and gates that may be used to isolate lines and facilities will completely seal. The contractor shall allow for leakage in planning its work and may, with the City's concurrence, test certain valves and gates before work involving isolation is begun. The Contractor shall provide adequate temporary pumping and piping facilities to clear the work areas as

necessary of water. The Contractor shall clean the work areas as required to perform the work.

11. Shutdown of existing facilities will be performed by City personnel or by the Contractor only under City personnel's supervision and with prior approval.
12. The Contractor is advised that any shutdown of facilities will place a considerable burden on the City's staff before, during, and after the shutdown. If through inadequate planning, lack of preparedness, faulty or inefficient workmanship or other causes controllable by the Contractor, delays, excessive time, or additional shutdowns are required that cause the City to incur extra cost, said extra cost will be assessed against the Contractor.
13. The City, at its sole discretion, may postpone each shutdown up to two weeks on three different occasions at no additional cost to the City.

Ten (10) Calendar Days prior to commencement of work, the contractor shall submit a project specific Construction Procedure, Sequence of Operations and Commissioning Plan. The plan shall provide detailed drawings and a written description of the construction procedure and sequence to complete work, including but not limited to:

1. 36" RBW piping
  - a. Potholing and other investigation
  - b. Sawcut of paving
  - c. Excavation and shoring
  - d. Installation of piping
  - e. Testing
  - f. Backfill of trench
  - g. Commissioning
  - h. Paving
2. Decant Pump Station
  - a. Preparation and implementation of temporary bypass pumping
  - b. Demolition
  - c. Pump replacement
  - d. Shear/slide Gate replacement
  - e. Installation of piping, valves, and other appurtenances
  - f. Miscellaneous metals
  - g. Testing and commissioning
3. Electrical & Controls

Contractor shall submit the plan to the City's representative for review. The Contractor shall not commence work prior to receiving an "Approved" or "Make Corrections Noted" submittal review response from the City.

#### SP-29 PERMITS

The Contractor shall be responsible for the application process and fees associated with obtaining all permits required for the commencement and execution of the project, including but not limited to permits for encroachment, construction water, discharge of construction water, right-of-entry, excavations and trench safety.

Hydrant permits can be obtained through the Water Department. The cost of the Hydrant Permit and construction water shall be paid directly to the Water Department. The cost of the Hydrant Permit and construction water is NOT included in the prices paid for the various proposal items of work. For permit application and associated costs please contact the Water Department at (916) 461-6177. The Contractor shall supply water as required for completion of the project at no additional cost to the City.

#### SP-30 ENVIRONMENTAL INFORMATION DOCUMENT

The Contractor is hereby notified that this project is subject to review under the California Environmental Quality Act (CEQA), and the City filed for a Categorical Exemption for this project.

#### SP-31 SPECIAL INSURANCE REQUIREMENTS

There will be no special insurance requirements for this project in regard to Excess or Umbrella Liability, Railroad protective Liability, Builder's Risk, or Environmental Liability Insurance (See General Provisions Section 3.10-D). The Contractor is hereby made aware of and responsible for submittal of the appropriate documentation required verifying adherence to the specific insurance requirements delineated herein. Failure to obtain insurance and submit required documentation of insurance in compliance with City requirements may, at the discretion of the City, result in the loss of a working day(s) toward completion of the project.

#### SP-32 ENERGY EFFICIENCY REQUIREMENTS

The Contractor will comply with the energy efficiency requirements in the state energy conservation plan issued as required by the Energy policy and Conservation Act (P.L. 94-163).

#### SP-33 SPECIAL PREVAILING WAGE REPORTING REQUIREMENTS

The Contractor shall comply with all State prevailing wage reporting requirements, per General Provisions Section 6.01-K.

#### SP-34 SAFETY AND ACCIDENT RESPONSE PLAN

20 days prior to the start of any on-site work, Contractor shall submit a Safety and Accident Response Plan. The plan shall detail Project-specific safety and accident prevention precautions and programs, complete with respect to procedures and actions that the Contractor intends all parties and individuals that will be on the work site to follow in order for the Contractor and all others to comply with all applicable laws and regulations, particularly Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S.



Department of Labor (OSHA). The Contractor shall not be allowed to proceed with onsite activity until the Owner's Representative has received the plan.

The Safety and Accident Response Plan shall also include the Contractor's Confined Space Program and/or permits, per General Provisions Section 10.04.

The Contractor shall revise their plan for safety precautions and programs at appropriate times to reflect changes in the construction conditions, the Work, the Contractor's means, methods, techniques, sequences, and procedures of construction. The Contractor shall disseminate the original plan and revisions to all parties and individuals that will be on the Work site.

The Contractor shall submit to the Owner's Representative, on a weekly basis, copies of all OSHA-required site records and training certificates. The Contractor shall perform a safety inspection at the end of each working day to identify and correct any unsafe conditions prior to leaving the site.

#### SP-35 SPECIAL DOCUMENTS REQUIRED FOR FINAL PAYMENT

The Contractor shall retain contract records for 3 years after final payment is made and all other pending matters are closed. In addition, access to pertinent contract records for the duration of the 3-year time frame shall be provided to the City and duly authorized representatives for the purpose of making audit, examination, excerpts, and transcriptions. Refer to General Provisions Section 8.11.

#### SP-36 (NOT USED)

#### SP-37 PROJECT WATER SOURCE

The Contractor must obtain a water use permit for construction water. Construction meters require a one-thousand-dollar (\$1,000) deposit. The monthly rental fee for the construction meter is one-hundred dollars (\$100) per month and the commodity charge for usage is \$1.90 per one-hundred cubic feet (CCF). The cost of the Hydrant Permit and construction water shall be paid directly to the Water Department. The cost of the Hydrant Permit and construction water is NOT included in the prices paid for the various proposal items of work. For permit application and associated costs please contact the Water Department at (916) 461-6177. The Contractor shall supply water as required for completion of the project at no additional cost to the City.

#### SP-38 OTHER CHANGES TO GENERAL PROVISIONS

The following reline edits (Special Provisions Attachment 1) to the General Provisions are hereby incorporated to the Contract Documents. Contractors shall check the box titled "CHECK HERE TO ACKNOWLEDGE CHANGES TO GENERAL PROVISIONS" in the Sealed Proposal acknowledging acceptance of these changes. **Failure to check this box will result in the Contractor's bid being considered non-responsive.**

## **SPECIAL PROVISIONS ATTACHMENT 1**

### **Section 2.06. Contractors/Subcontractors Dir Registration Requirement**

Contractors and subcontractors on all public works projects are required to register with the Department of Industrial Relations (DIR) in accordance with Section 1725.5 of the Labor Code. Beginning March 1, 2015, only bids from contractors and subcontractors that are listed on the DIR website as registered will be accepted. All contracts awarded on or after April 1, 2015 are required to use only registered contractors and subcontractors. The DIR will keep an up to date listing of registered contractors at:

<https://efiling.dir.ca.gov/PWCR/Search.action>

Inadvertent listing of an unregistered subcontractor will not necessarily invalidate a bid. Unregistered contractors or subcontractors may be replaced with registered ones. A contract with an unregistered contractor or subcontractor is subject to cancellation, but is not void as to past work. Contractors and subcontractors must register and pay the applicable fee; this may be done online at the DIR website:

<https://efiling.dir.ca.gov/PWCR/ActionServlet?action=displayPWCRegistrationForm>

### **Section 2.07 Competency of Bidders.**

It is the intention of the City to award a Contract only to a Bidder who furnishes satisfactory evidence that the Bidder has the requisite experience and ability, and has sufficient capital, facilities, and plant to enable the Contractor to prosecute the Work successfully and promptly, and to complete the Work within the time stated in the Contract. If required by the Special Provisions, a statement of experience and business standing, together with that of particular Subcontractors that were designated in the Bid, shall be submitted on a City-provided form by the three (3) apparent low Bidders within seven (7) Calendar Days after the opening of Bids. Bidders in contention for contract awards may be asked to attend a post-bid interview. To determine the experience of a Bidder, the City will consider any relevant evidence that the Bidder, and/or its personnel, has satisfactorily performed on other contracts of similar nature and magnitude or difficulty.

### **Section 2.08. Joint Venture Bids.**

If two or more prospective Bidders desire to bid jointly as a joint venture on a single project, the joint venture Bid must be accompanied by a notarized copy of a valid license issued to the joint venture by the Contractor's State License Board. If a copy of the joint venture license is not filed with the Bid, the Bid will be rejected.

### **Section 2.09. Subcontractors.**

In accordance with the Subletting and Subcontracting Fair Practices Act of the Public Contract Code, section 4100 et seq. (the "Act"), each Bidder shall list in the bid form: The name and the location of the place of business of each Subcontractor whom the Bidder proposes to perform work or labor or render service to the prime Contractor in or about the construction of the Work, or a Subcontractor licensed by the State of California who, under subcontract to the prime Contractor, is proposed by the Bidder to specially fabricate and install a portion of the Work according to detailed drawings contained in the Contract, in an amount in excess of one-half of one percent (0.5%) of the total bid, including additive Alternates, if any, or, in the case of a Bid for the construction of streets or highways, including bridges, in excess of

one-half of one percent (0.5%) of the Bidder's total bid, including additive Alternates, or ten thousand dollars (\$10,000), whichever is greater.

The portion of the Work that will be done by each Subcontractor. The Bidder shall list only one Subcontractor for each portion as is defined by the Bidder in the Bid. If a Bidder fails to specify a Subcontractor for any portion of the Work to be performed under the Contract (or specifies more than one Subcontractor for the same work) as required in Section 2.08(A) above, the Bidder agrees that the Bidder is fully qualified to perform that portion itself and that the Bidder shall perform that portion of the Work.

If after the award of the Contract, the Contractor subcontracts any portion of the Work, except as provided in Section 4107 or 4109 of the Act, the Contractor shall be subject to the penalties specified in Section 4111 of the Act.

The apparent low Bidder shall submit the license numbers of all Subcontractors to the City within ten (10) Calendar Days, not counting Saturdays, Sundays, and holidays, of Bid opening. If the low Bidder is not the apparent low Bidder, the low Bidder shall submit the license numbers of all Subcontractors to the City within ten (10) Calendar Days, not counting Saturdays, Sundays, and holidays, of the date notified.

#### **Section 2.10. Addenda.**

The correction of any material discrepancies in, or material additions to/omissions from, the Plans, Specifications, or other Contract, or any interpretation thereof, during the bidding period will be made only by an Addendum issued by the City. A copy of each Addendum issued by the City will be mailed or delivered to each planholder listed on the City planholder list and is a part of the Contract. Any interpretation or explanation not included in the Addenda will not be considered binding. Bids must include acknowledgment of all Addenda issued prior to the bid date.

Section

#### **Section 2.11. Assignment of Antitrust Actions.**

The Bidder is required to comply with Public Contract Code section 7103.5(b), which addresses assignment of antitrust actions.

#### **Section 2.12 Bid Guarantee.**

The Bid shall be accompanied by a bid guarantee in the form of a bidder's bond, cash, a certified check or a cashier's check in an amount not less than ten percent (10%) of the bid amount, including additive Alternates, if any. A bid bond shall be executed in favor of the City by a surety company authorized to do business in California, and the attorney-in-fact who executes the bond on behalf of the surety shall attach to the bond a certified, current copy of its Power of Attorney. A certified or cashier's check must be made payable to the City. The bid guarantee shall pledge that the Bidder will enter into a contract with the City in accordance with the terms stated in the bid form and Agreement for Construction and will furnish required performance and payment bonds and insurance certificates. The City is authorized to forfeit the bid guarantee as necessary to reimburse the City for costs incurred for failure of the successful Bidder to enter into the contract and/or furnish the required performance and/or payment bond and/or insurance certificates. The amount of the bid guarantee shall not be deemed to constitute a penalty or liquidated damages. The City is not precluded by a bid guarantee from recovering from the defaulting Bidder damages in excess of the amount of said bid guarantee incurred as a result of

the failure of the successful Bidder to enter into the contract with the City for the Work or the failure of the successful Bidder to provide the required bonds and/or insurance certificates. Bid guarantees for the unsuccessful bidders will be released upon contract execution by the bidder awarded the contract or 60 days after the bid opening, whichever is earlier.

### **Section 2.13. Modification or Withdrawal of Bid.**

A Bid may be modified or withdrawn at any time prior to the hour fixed in the Notice to Contractors for the submission of Bids by a written request of the Bidder filed with the City at the location where the Bid was submitted. Modifications and/or withdrawals shall be in writing. Telephone or fax modifications will not be accepted. The withdrawal of a Bid will not prejudice Special Provisions Attachment 1 the right of a Bidder to file a new Bid within the time prescribed.

### **Section 2.14 Public Opening of Bids.**

Bids will be opened and read publicly at the time and place indicated in the Notice to Contractors or in a subsequent Addendum. Bidders or their authorized representatives and other interested parties are invited to be present.

### **Section 2.15 Rejection of Bids.**

The City reserves the right to reject any and all Bids. The City reserves the right to waive irregularities in a Bid and to make an award in the best interest of the City. Bids containing omissions, erasures, alterations, conditions, or additions not called for may be rejected.

### **Section 2.16 Disqualification of Bidders.**

More than one Bid from any individual, firm, partnership, corporation or association, under the same or different names, will not be considered. Reasonable ground for believing that any Bidder is interested in more than one Bid for the Work will cause rejection of all Bids in which such Bidder is interested. If there is reason to believe that collusion exists among Bidders, none of the participants of such collusion will be considered.

Any Bid in which the prices obviously are unbalanced may be rejected.

### **Section 2.17 Relief of Bidders.**

Attention is directed to Public Contract Code sections 5100 through 5107, concerning relief of Bidders and in particular to the requirement therein that if the Bidder claims a material mistake was made in its Bid, the Bidder shall give the City written notice within five (5) days after the opening of the Bids (excluding Saturdays, Sundays, or City holidays) of the alleged mistake, explaining in the notice in detail how the mistake occurred.

### **Section 2.18 Bid Protests**

As set forth in the Resolution of Disputes Regarding the Bidding Process form to be included with the bids, any Bidder may file a protest against the award of the Contract to any other Bidder. All Bidders shall be provided with notice of the date and time of the City Council meeting at which the award of the Contract for the Project shall be considered. All Bidders will be provided with an opportunity to bring to the City Council's attention disputes and/or protests

regarding the bidding process. No Bidder may bring any action or proceeding challenging the bidding process unless the alleged grounds for the dispute and/or protest are presented in a timely manner and consistent with this section. to the City Council before or during the meeting Any Bidder complying with these procedures may bring an action within sixty (60) Calendar Days from the action of the City Council, in accordance with Section 860 et seq of the California Code of Civil Procedure, to determine the validity of the City Council's action on the award of the Contract. See form for Resolution of Disputes Regarding the Bidding Process governing the procedures for disputes and/or protests regarding the bidding process.

- A. Any bid protest must be in writing and received by the City Clerk at 50 Natoma Street, Folsom, CA 95630 before 5:00 p.m. no later than five (5) working days following bid opening (the "Bid Protest Deadline") and must comply with the following requirements; however, if the date set for the City Council bid award is less than five (5) working days from the bid opening, the bid protest must be submitted to the City Clerk at least 24 hours prior to the time set for the City Council meeting:
- B. Only a bidder who has actually submitted a Bid Proposal is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit bid protests. A bidder may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest.
- C. The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address, email address, and telephone number of the person representing the protesting bidder if different from the protesting bidder.
- D. A copy of the protest and all supporting documents must also be transmitted by fax or by email, by or before the Bid Protest Deadline, to the protested bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest
- E. The protested bidder may submit a written response to the protest, provided the response is received by Owner before 5:00p.m., within two (2) working days after the Bid Protest Deadline or after receipt of the bid protest, whichever is sooner (the "Response Deadline"). If there are less than two working days remaining prior to the City Council meeting to award the bid, the response must be submitted to the City Clerk prior to the start of the City Council meeting. The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person representing the protested bidder if different from the protested bidder.
- F. A copy of the response and all supporting documents must also be transmitted by fax or by e-mail, by or before the Bid Protest Deadline, to the protesting bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.
- G. The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. The bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.

- H. Owner reserves the right to award the Contract to the bidder it has determined to be the responsible bidder submitting the lowest responsive bid, and to issue a notice to proceed with the work notwithstanding any pending or continuing challenge to its determination.

### **Section 3.02. Award of the Contract.**

Award of the Contract will be to the lowest, responsive, responsible Bidder whose Bid complies with the specified requirements. The award, if made, will be made within 45 days after the opening of Bids, unless otherwise specified. If the lowest responsive, responsible Bidder refuses or fails to execute the Contract or to provide required bonds and/or insurance certificates, the City may award the Contract to the second lowest responsive, responsible Bidder. The specified period of time within which the award may be made may be subject to extension for further periods as agreed upon in writing by the City and the Bidder.

The City reserves the right to award the Contract based on any combination of base bid and Alternates as determined by the City. This process is conducted by the City in a "blind selection" format, i.e., without knowledge of the identity of any of the Bidders before ranking of all Bidders from lowest to highest has been determined. All awards will be made in the City's best interest. The City will comply with state law requirements for submission of a PWC-100 form (contract award notice) to DIR for all public works projects.

### **Section 3.03. Performance and Payment Bonds.**

The format of the Performance Bond and Payment Bond forms shall be those contained in these Specifications. As part of the execution of the Contract, the successful Bidder shall furnish the following corporate surety bonds to the benefit of the City. Bonds shall be executed by a surety company authorized to do business in the State of California. When the amount to be paid to the Contractor is based upon units of work to be performed or items to be provided, the term Contract Sum as used below for the purpose of posting Performance and Payment Bonds shall be computed on the basis of the unit price bid multiplied by the Estimated Quantities of work to be performed.

#### **A. Performance Bond.**

The Performance Bond, to guarantee the performance of all covenants and stipulations of the Contract, shall be on the form provided by the City and shall be in a sum not less than one hundred percent (100%) of the original Contract Sum as set forth in the Contract. The bond shall contain a provision that the surety thereon waives the provisions of California Civil Code sections 2819 and 2845.

#### **B. Payment Bond.**

The Payment Bond, to guarantee the payment of wages and of bills contracted for materials, supplies, or equipment used in the performance of the Contract, shall be on the form provided by the City and shall be in a sum not less than one hundred percent (100%) of the original Contract Sum as set forth in the Contract. The bond shall be in accordance with the provisions of California Civil Code section 8152, 8154, and 9550, 9552, 9554, 9558, 9560, and 9564, and any acts mandatory thereof, and shall, by its terms, inure to the benefit of all persons, companies, or corporations entitled to file claims under California Civil Code section 9100 and California Unemployment Insurance Code section 13020. Said bond shall also contain a provision that the surety waives the provisions of California Code of Civil Procedure section 2819 and 2845.

### **Section 5.19. Inspection.**

All work done and all materials and equipment furnished shall be subject to the inspection and approval of the City. Neither the final inspection and payment, nor any interim inspection or progress payment shall relieve the Contractor of its obligation to fulfill the Contract as required by the Contract Documents. Any work, materials or equipment not meeting the requirements and intent of the Contract Documents may be rejected, and unsuitable work or materials shall be made good, notwithstanding the fact that such work or materials may previously have been inspected and/or payment therefor may have been made.

The Project Inspector shall be considered to be a representative of the City and shall be designated at the pre-construction conference. It is the Project Inspector's duty to inspect the Work.

Where the Contract Documents, instructions by the Project Inspector, Owner's Representative or the Architect or Consulting Engineer, laws, ordinances, or any public authority having jurisdiction require work to be inspected, tested or approved before the Work proceeds, such work shall not proceed, nor shall it be covered up without inspection. If any part of the Work is covered prior to inspection, the City may order the work to be uncovered so that inspection may be accomplished. The Contractor shall bear all expenses of such examination and satisfactory reconstruction.

The Contractor shall provide written notice to the Project Inspector at least twenty-four (24) hours in advance of the readiness for inspection.

All work shall be available for inspection and the Project Inspector shall have full access to review all work during all working times. The Contractor shall provide all necessary means of safe access (e.g. ladders) for the Project Inspector to perform his/her duties. The Contractor shall furnish the Project Inspector with any information necessary to fully inform him/her of conditions.

The Project Inspector shall have the authority to order the work designated for inspection stopped if a determination is made that work is proceeding in violation of the Contract Documents or any orders issued by the City, its representatives, or the Architect or Consulting Engineer. The failure of the Project Inspector to order the work stopped does not excuse the Contractor from complying with the Contract Documents for that work. Upon issuing a stop work notice, the Project Inspector shall notify the Architect or Consulting Engineer, who shall inspect the work in question and determine whether it does or does not comply with the Contract Documents. The decision of the Architect or Consulting Engineer shall be final. The Contractor shall thereafter comply with the instructions of the Architect or Consulting Engineer regarding corrections needed to cure the defect. The suspended work shall be resumed only when the instructions are fulfilled. The Contractor shall not be entitled to an extension of time in the event of such suspension of work.

Should the Owner's Representative or the Architect or Consulting Engineer determine that it is necessary or advisable to make an inspection of work already completed at any time before final inspection and acceptance of the Work, by removing or exposing any work, the Contractor shall, upon instruction of the Owner's Representative, promptly furnish all necessary facilities, labor, and materials to do so. If the work is found to be defective in any respect due to the fault of the Contractor or any Subcontractor, the Contractor shall bear all expenses of such examination and satisfactory reconstruction. If, however, the work is found to meet the requirements of the Contract Documents, the additional cost of labor and material necessarily

involved in the examination and replacement shall be allowed the Contractor and a change order shall be issued for such cost and any time extension justified by delays to the critical path. Whenever the Contractor arranges to work at night or any time when work is conducted other than the normal 8-hour work day or 40-hour week, or to vary the period during which work is carried on each day, it shall give the Owner's Representative and the Project Inspector a minimum of 48-hours notice so that inspection may be provided. Additional inspection costs incurred because of overtime or shift work that are incurred at the request of the City shall be paid by the City. All other additional inspection costs shall be borne by the contractor unless otherwise agreed to by the parties. If this overtime work is necessitated by the Contractor's error or failure to perform, the cost of inspection will be borne by the Contractor.

#### **SECTION 6.01. COMPLIANCE WITH LAWS AND REGULATIONS.**

The Contractor shall keep itself fully informed of and shall observe and comply with, and shall cause any and all persons, firms, or corporations employed by it or under it to observe and comply with all federal and state laws, and county or municipal ordinances, regulations, orders, and decrees which in any manner affect those engaged or employed on the Work, or the materials used in the Work, or in any way affect the conduct of the Work. No pleas of misunderstanding of such laws, ordinances, codes, regulations, orders or decrees or ignorance of the same on the part of the Contractor shall modify the provisions of the Contract Documents. The Contractor and the Contractor's surety shall indemnify and save harmless the City and the City's officers, officials, agents, employees, volunteers, members, affiliates and their duly authorized representatives against any claim for liability arising from, or based upon the violation of any such law, ordinance, regulation, order or decree, whether by the Contractor, the Contractor's employees, or any Subcontractor or supplier.

Attention is directed to certain laws that affect the Contract. The listing of these laws in this Section is not to be construed as a listing of all applicable laws. The Contractor is solely responsible for familiarity and compliance with all applicable laws.

##### **A. Prevailing Wage Rate.**

The Contractor shall pay, and shall cause all Subcontractors under it to pay, not less than the specified prevailing wage rates, including, but not limited to, overtime, Saturday, Sunday and holiday work, travel and subsistence, to all workers employed in the execution of this Contract. Pursuant to Chapter 1 of Part 7, Division 2 of the Labor Code, commencing with Section 1770, the Director of the California Department of Industrial Relations (DIR) of the State of California has determined the prevailing rate of wages in the locality in which the work on the project is to be performed for each craft, classification, or type of worker needed to execute this Contract. The prevailing rates so determined are on file with the City Clerk and they are available for public inspection. They may also be obtained on the internet at

<http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>

Those prevailing wage rates hereby are incorporated in this Contract and made a part hereof. The Contractor should contact the DIR as indicated in the prevailing wage determinations to obtain predetermined wage changes.

The responsibility to check prevailing wage rates is the Contractor's. In the event this Contract calls for work requiring any craft, classification, or type of worker for which the DIR has not specified a prevailing wage rate, the Contractor shall contact the Owner's Representative within ten days following the first advertisement to request a determination. After consultation with the DIR, the City will issue a determination of the prevailing wage for the specified work, and the



Contractor and all Subcontractors shall pay each worker engaged in the specified work not less than those rates. Pending such determination, the wages may be assumed to be those in the applicable collective bargaining agreement, but no adjustment in the Contract Sum shall be made if such assumption is incorrect.

The Contractor shall obtain and post copies of all applicable prevailing wage rates in a prominent place at the job site, in accordance with the regulations of the Department of Industrial Relations.

#### B. Hours of Work; Approval of Schedules.

Eight (8) hours of labor constitutes a legal day's work, and forty (40) hours constitutes a legal work week. No worker employed at any time by the Contractor, or by any Subcontractor upon the Project, shall be required or permitted to work more than eight (8) hours in any one calendar day or forty (40) hours in any one week, except as provided in Labor Code Sections 1810 through 1815.

Overtime shall be paid at the rate of not less than one and one-half (1-1/2) times the basic rate of pay, or at such higher rate as may be required by the DIR, applicable statutes or collective bargaining agreements.

The City reserves the right to approve or disapprove the days scheduled for work, and the hours during which work is in progress. Overtime and shift work may be established by the Contractor with reasonable notice and the written permission of the City. No work other than overtime and shift work shall be done between the hours of 6:00 p.m. and 7:00 a.m., except such work as is necessary for the proper care and protection of the work already performed or except in case of an emergency. Failure of the Contractor to perform the work in accordance with this policy shall be deemed to be a failure on the Contractor's part to comply with the Contract and is cause for termination.

#### C. Records of Hours Worked and Wages.

All public works projects are subject to compliance monitoring and enforcement by the Department of Industrial Relations in accordance with Section 1771.4 of the Labor Code. The Contractor and all Subcontractors shall furnish the records specified in Section 1776 directly to the Labor Commissioner in accordance with Section 1771.4. The Contractor shall maintain, and shall cause all its Subcontractors to maintain, records of the hours and wages of all employees employed on the Project, and those records shall be open at all times for inspection by the City and/or the Division of Labor Standards Enforcement of the Department of Industrial Relations, in accordance with Sections 1776 and 1812 of the Labor Code.

The Contractor shall not carry on its payrolls any person not actually employed by the Contractor, nor shall it carry on its payrolls employees of a Subcontractor. The Contractor shall show on its payrolls all persons actually employed by the Contractor on the Project, in any capacity. The Contractor shall supervise all Subcontractors to ensure that all Subcontractors comply with this Section.

The Contractor shall provide, and shall require all Subcontractors to provide, on a monthly basis, included with the progress payment request and the final payment request, verification of the actual wages paid to any or all employees on the Project, including but not limited to copies of timecards, payroll checks and stubs, job cost detail ledger for labor, evidence of payment of benefit contributions, and any other records necessary to establish compliance. The Contractor shall submit the monthly certified payrolls for all workers employed at the Site directly to the Owner's Representative with the monthly progress payment request. Failure to submit timely,

complete certified payrolls or the other documents described in this section shall entitle the City to withhold payment from the Contractor. Additionally, in the event of noncompliance with this section, the Contractor shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply. In the event of continued noncompliance, the penalties specified in subdivision (h) of the Labor Code section 1776 may be deducted from progress payments to the Contractor.

In accordance with Government Code Section 8546.7, or any amendments thereto, all books, records, and files of the Contractor, or any Subcontractor connected with the performance of this Contract, shall be subject to examination and audit by the Auditor General for a period of three (3) years after final payment. Contractor shall preserve and cause to be preserved such books, records and files for the audit period.

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**EQUIPMENT: BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Requirements of this Specification Section apply to all equipment provided on the Project including those found in other Divisions even if not specifically referenced in individual "Equipment" Articles of those Specification Sections.

**1.2 QUALITY ASSURANCE**

A. Referenced Standards:

1. American Bearing Manufacturers Association (ABMA).
2. American Gear Manufacturers Association (AGMA).
3. ASTM International (ASTM):
  - a. E1934, Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography.
  - b. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
4. Hydraulic Institute (HI):
  - a. 9.6.4, Centrifugal and Vertical Pumps for Vibration Measurements and Allowable Valves.
5. International Electrotechnical Commission (IEC).
6. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
7. International Organization for Standardization (ISO):
  - a. 1940, Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerances.
8. National Electrical Manufacturers Association (NEMA):
  - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - b. ICS 6, Enclosures for Industrial Control and System.
  - c. MG 1, Motors and Generators.
9. InterNational Electrical Testing Association (NETA):
  - a. ATS, Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems.
10. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC):
    - 1) Article 430, Motors, Motor Circuits, and Controllers.
11. National Institute for Certification in Engineering Technologies (NICET).
12. National Institute of Standards and Technology (NIST).
13. Occupational Safety and Health Administration (OSHA):
  - a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.
14. Underwriters Laboratories, Inc. (UL).
  - a. 508, Standard for Safety Industrial Control Equipment.
  - b. 508A, Standard for Safety Industrial Control Panels.

B. Miscellaneous:

1. A single manufacturer of a "product" shall be selected and utilized uniformly throughout Project even if:
  - a. More than one (1) manufacturer is listed for a given "product" in Specifications.
  - b. No manufacturer is listed.

2. Equipment, electrical assemblies, related electrical wiring, instrumentation, controls, and system components shall fully comply with specific NEC requirements related to area classification and to NEMA 250 and NEMA ICS 6 designations shown on Electrical Power Drawings and defined in the Electrical specifications.
3. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and verify their compatibility.

### 1.3 DEFINITIONS

- A. Product: Manufactured materials and equipment.
- B. Major Equipment Supports - Supports for Equipment:
  1. Located on or suspended from elevated slabs with supported equipment weighing 2000 LBS or greater, or;
  2. Located on or suspended from roofs with supported equipment weighing 500 LBS or greater, or;
  3. Located on slab-on-grade or earth with supported equipment weighing 5000 LBS or more.
- C. Equipment:
  1. One (1) or more assemblies capable of performing a complete function.
  2. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection.
  3. Not limited to items specifically referenced in "Equipment" articles within individual Specifications.
- D. Installer or Applicator:
  1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
  2. Installer and applicator are synonymous.

### 1.4 SUBMITTALS

- A. Shop Drawings:
  1. General for all equipment:
    - a. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
    - b. Data sheets that include manufacturer's name and complete product model number.
      - 1) Clearly identify all optional accessories that are included.
    - c. Acknowledgement that products submitted comply with the requirements of the standards referenced.
    - d. Manufacturer's delivery, storage, handling, and installation instructions.
    - e. Equipment identification utilizing numbering system and name utilized in Drawings.
    - f. Equipment installation details:
      - 1) Location of anchorage.
      - 2) Type, size, and materials of construction of anchorage.
      - 3) Anchorage setting templates.
      - 4) Manufacturer's installation instructions.
    - g. Equipment area classification rating.
    - h. Shipping and operating weight.
    - i. Equipment physical characteristics:
      - 1) Dimensions (both horizontal and vertical).
      - 2) Materials of construction and construction details.
    - j. Equipment factory primer and paint data.
    - k. Manufacturer's recommended spare parts list.
    - l. Equipment lining and coatings.
    - m. Equipment utility requirements include air, natural gas, electricity, and water.
    - n. Ladders and platforms provided with equipment:
      - 1) Certification that all components comply fully with OSHA requirements.



- 2) Full details of construction/fabrication.
- 3) Scaled plan and sections showing relationship to equipment.
2. Mechanical and process equipment:
  - a. Operating characteristics:
    - 1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.
    - 2) Brake horsepower requirements.
    - 3) Copies of equipment data plates.
  - b. Piping and duct connection size, type and location.
  - c. Equipment bearing life certification.
  - d. Equipment foundation data:
    - 1) Equipment center of gravity.
    - 2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.
3. Electric motor:
  - a. Motor manufacturer and model number.
  - b. Complete motor nameplate data.
  - c. Weight.
  - d. NEMA design type.
  - e. Enclosure type.
  - f. Frame size.
  - g. Winding insulation class and temperature rise.
  - h. Starts per hour.
  - i. Performance data:
    - 1) Guaranteed minimum efficiencies at 100 percent, 75 percent, and 50 percent of full load
    - 2) Guaranteed minimum power factor at 100 percent, 75 percent, and 50 percent of full load.
    - 3) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
    - 4) Starting, full load, and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
  - j. Bearing data and lubrication system.
  - k. Thermal protection system including recommended alarm and trip settings for winding and bearing RTD's.
  - l. Fabrication and/or layout drawings:
    - 1) Dimensioned outlined drawing.
    - 2) Connection diagrams including accessories (strip heaters, thermal protection, etc.).
  - m. Certifications:
    - 1) When utilized with a reduced voltage starter, certify that motor and driven equipment are compatible.
    - 2) When utilized with a variable frequency controller, certify motor is inverter duty and the controller and motor are compatible.
      - a) Include minimum speed at which the motor may be operated for the driven machinery.
  - n. Electrical gear:
    - 1) Unless specified in a narrow-scope Specification Section, provide the following:
      - a) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.
    - 2) Control panels:
      - a) Panel construction.
      - b) Point-to-point ladder diagrams.
      - c) Scaled panel face and subpanel layout.
      - d) Technical product data on panel components.
      - e) Panel and subpanel dimensions and weights.
      - f) Panel access openings.

- g) Nameplate schedule.
  - h) Panel anchorage.
- 4. Systems schematics and data:
  - a. Provide system schematics where required in system specifications.
    - 1) Acknowledge all system components being supplied as part of the system.
    - 2) Utilize equipment, instrument and valving tag numbers defined in the Contract Documents for all components.
    - 3) Provide technical data for each system component showing compliance with the Contract Document requirements.
    - 4) For piping components, identify all utility connections, vents and drains which will be included as part of the system.
- 5. For factory painted equipment, provide paint submittals in accordance with Specification Section 09 96 00.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
  - 1. Sample form letter for equipment field certification.
  - 2. Certification that equipment has been installed properly, has been initially started up, has been calibrated and/or adjusted as required, and is ready for operation.
  - 3. Certification for major equipment supports that equipment foundation design loads shown on the Drawings or specified have been compared to actual loads exhibited by equipment provided for this Project and that said design loadings are equal to or greater than the loads produced by the equipment provided.
  - 4. Field noise testing reports if such testing is specified in narrow-scope Specification Sections.
  - 5. Notification, at least one (1) week in advance, that motor testing will be conducted at factory.
  - 6. Certification from equipment manufacturer that all manufacturer-supplied control panels that interface in any way with other controls or panels have been submitted to and coordinated with the supplier/installer of those interfacing systems.
  - 7. Motor test reports.
  - 8. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-made modifications.
  - 9. Provide three (3) bound final written reports documenting vibration monitoring and testing for specified equipment.
    - a. Include the acceptance criteria of all equipment tested.
    - b. Provide individual tabbed sections for information associated with each piece of tested equipment.
  - 10. Preliminary field quality control testing format to be used as a basis for final field quality control reporting.
  - 11. Testing and monitoring reports in accordance with PART 3 of this Specification Section.
  - 12. Certification that driven equipment and VFD are compatible.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Motors:
    - a. Baldor.
    - b. General Electric.
    - c. Marathon Electric.

- d. Reliance Electric.
- e. Siemens.
- f. Teco-Westinghouse.
- g. U.S. Motors.
- h. WEG.

## 2.2 MANUFACTURED UNITS

### A. Electric Motors:

1. Where used in conjunction with adjustable speed AC or DC drives, provide motors that are fully compatible with the speed controllers.
2. Design for frequent starting duty equivalent to duty service required by driven equipment.
3. Design for full voltage starting.
4. Design bearing life based upon actual operating load conditions imposed by driven equipment.
5. Size for altitude of Project.
6. Furnish with stainless steel nameplates which include all data required by NEC Article 430.
7. Use of manufacturer's standard motor will be permitted on integrally constructed motor driven equipment specified by model number in which a redesign of the complete unit would be required in order to provide a motor with features specified.
8. AC electric motors less than 1/3 HP:
  - a. Single phase, 60 Hz, designed for the supply voltage shown on the Drawings.
  - b. Permanently lubricated sealed bearings conforming to ABMA standards.
  - c. Built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element with stainless steel enclosure.
9. AC electric motors 1/3 to 1 HP:
  - a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
  - b. Permanently lubricated sealed bearings conforming to ABMA standards.
    - 1) For single phase motors, provide built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element.
10. AC electric motors 1-1/2 to 10 HP:
  - a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
  - b. Permanently lubricated sealed bearings conforming to ABMA standards.
  - c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.
11. AC electric motors greater than 10 HP:
  - a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
  - b. Oil or grease lubricated antifriction bearings conforming to ABMA standards.
    - 1) Design bearing life for 90 percent survival rating at 50,000 HRS of operation for motors up to and including 100 HP.
  - c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.
12. Severe duty motor to have the following minimum features:
  - a. All cast iron construction.
  - b. Gasketed conduit box.
  - c. Epoxy finish for corrosion protection.
  - d. Hydrosopic varnish on windings for corrosion protection.
  - e. Drain plug and breather.

### B. NEMA Design Squirrel Cage Induction Motors:

1. Provide motors designed and applied in compliance with NEMA and IEEE for the specific duty imposed by the driven equipment.
2. Motors to meet NEMA MG 1 (NEMA Premium) efficiencies.
3. Do not provide motors having a locked rotor kVA per HP exceeding the NEMA standard for the assigned NEMA code letter.
4. For use on variable frequency type adjustable speed drives, provide:
  - a. Induction motors that are in compliance with NEMA MG 1, Part 31.

- b. Nameplate identification meeting NEMA MG 1 Part 31 requirements.
- c. Insulated drive end bearing on all motors.
- d. Shaft grounding ring on all motors:
  - 1) Factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber shaft contacting material.
  - 2) Electro Static Technology AEGIS SGR Bearing Protection Ring or approved equal.
- 5. Design motor insulation in accordance with NEMA standards for Class F insulation with Class B temperature rise above a 40 DegC ambient.
- 6. Design motors for continuous duty.
- 7. Size motors having a 1.0 service factor so that nameplate HP is a minimum of 15 percent greater than the maximum HP requirements of the driven equipment over its entire operating range.
  - a. As an alternative, furnish motors with a 1.15 service factor and size so that nameplate HP is at least equal to the maximum HP requirements of the driven equipment over its entire operating range.
- 8. Motor enclosure and winding insulation application:
  - a. The following shall apply unless modified by specific Specification Sections:

MOTOR LOCATION	MOTOR ENCLOSURE / WINDING INSULATION
Unclassified Indoor Areas	DPFG (for horizontal motors), TEFC, Standard Insulation
Wet indoor Areas	TEFC, Standard Insulation WP-II (for vertical motors)
Wet outdoor Areas	TEFC, Extra Dip and Bake for Moisture WP-II (for vertical motors)
Class I, Division 2 Areas	Explosion Proof, Approved for Class I Division 2 Locations

NOTE: Provide TENV motors in the smaller horsepower ratings where TEFC is not available.

- 9. Provide oversize conduit box complete with clamp type grounding terminals inside the conduit box.
- C. Submersible Motors: Refer to individual narrow-scope Specification Sections for submersible motor requirements.
- D. V-Belt Drive:
  - 1. Provide each V-belt drive with sliding base or other suitable tension adjustment.
  - 2. Provide V-belt drives with a service factor of at least 1.6 at maximum speed.
  - 3. Provide staticproof belts.

## 2.3 COMPONENTS

- A. Gear Drives and Drive Components:
  - 1. Size drive equipment capable of supporting full load including losses in speed reducers and power transmission.
  - 2. Provide nominal input horsepower rating of each gear or speed reducer at least equal to nameplate horsepower of drive motor.
  - 3. Design drive units for 24 HR continuous service, constructed so oil leakage around shafts is precluded.
  - 4. Utilize gears, gear lubrication systems, gear drives, speed reducers, speed increasers and flexible couplings meeting applicable standards of AGMA.
  - 5. Gear reducers:
    - a. Provide gear reducer totally enclosed and oil lubricated.
    - b. Utilize antifriction bearings throughout.
    - c. Provide worm gear reducers having a service factor of at least 1.20.
    - d. Furnish other helical, spiral bevel, and combination bevel-helical gear reducers with a service factor of at least 1.50.

## **2.4 ACCESSORIES**

- A. Guards:
  - 1. Provide each piece of equipment having exposed moving parts with full length, easily removable guards, meeting OSHA requirements.
  - 2. Interior applications:
    - a. Construct from 16 GA stainless steel rolled to conform to shaft or coupling surface.
    - b. Utilize non-flattened type 16 GA stainless steel with nominal 1/2 IN spacing.
    - c. Connect to equipment frame with stainless steel bolts and wing nuts.
  - 3. Exterior applications:
    - a. Construct from 16 GA stainless steel.
    - b. Construct to preclude entrance of rain, or moisture.
    - c. Roll to conform to shaft or coupling surface.
    - d. Connect to equipment frame with stainless steel bolts and wing nuts.
- B. Anchorage:
  - 1. Cast-in-place anchorage:
    - a. Provide ASTM F593, Type 316 stainless steel anchorage for all equipment.
    - b. Configuration and number of anchor bolts shall be per manufacturer's recommendations.
    - c. Provide two (2) nuts for each bolt.
  - 2. Drilled anchorage:
    - a. Adhesive anchors per Specification Section 05 50 00.
    - b. Epoxy grout per Specification Section 03 09 00.
    - c. Threaded rods same as cast-in-place.
- C. Data Plate:
  - 1. Attach a stainless steel data plate to each piece of rotary or reciprocating equipment.
  - 2. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.
- D. Gages:
  - 1. Provide gages in accordance with Specification Section 40 91 10.
  - 2. Provide at the following locations:
    - a. Inlet and outlet of all reciprocating, centrifugal and positive displacement mechanical and process equipment.
    - b. At locations identified on Drawings.
  - 3. Utilize tapping sleeves for mounting per Specification Section 40 05 00.
- E. Lifting Eye Bolts or Lugs:
  - 1. Provide on all equipment 50 LBS or greater.
  - 2. Provide on other equipment or products as specified in the narrow-scope Specification Sections.

## **2.5 FABRICATION**

- A. Design, fabricate, and assemble equipment in accordance with modern engineering and shop practices.
- B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.
- C. Furnish like parts of duplicate units to be interchangeable.
- D. Ensure that equipment has not been in service at any time prior to delivery, except as required by tests.
- E. Furnish equipment which requires periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts.

1. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.
- F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option.
  1. Provide drain connection for 3/4 IN PVC tubing.
- G. Machine the mounting feet of rotating equipment.
- H. Fabricate equipment which will be subject to Corrosive Environment in such a way as to avoid back to back placement of surfaces that can not be properly prepared and painted.
  1. When such back to back fabrication can not be avoided, provide continuous welds to seal such surfaces from contact with corrosive environment.
  2. Where continuous welds are not practical, after painting seal the back to back surfaces from the environment in accordance with Specification Section 07 92 00.
- I. Critical Speed:
  1. All rotating parts accurately machined and in as near perfect rotational balance as practicable.
  2. Excessive vibration is sufficient cause for equipment rejection.
  3. Ratio of all rotative speeds to critical speed of a unit or components: Greater than 1.2.
- J. Control Panels Engineered and Provided with the Equipment by the Manufacturer:
  1. Manufacturer's standard design for components and control logic unless specific requirements are specified in the specific equipment Specification Section.
  2. NEMA or IEC rated components are acceptable, whichever is used in the manufacturer's standard engineered design, unless specific requirements are required in the specific equipment Specification Section.
  3. Affix entire assembly with a UL 508A label "Listed Enclosed Industrial Control Panel" prior to delivery.
    - a. Control panels without an affixed UL 508A label shall be rejected.

## **2.6 SHOP OR FACTORY PAINT FINISHES**

- A. Electrical Equipment:
  1. Provide factory-applied paint coating system(s) for all electrical equipment components except those specified in Specification Section 09 96 00 to receive field painting.
    - a. Field painted equipment: See Specification Section 09 96 00 for factory applied primer/field paint compatibility requirements.
- B. Field paint other equipment in accordance with Specification Section 09 96 00.
  1. See Specification Section 09 96 00 for factory applied primer/field paint compatibility requirements.

## **2.7 SOURCE QUALITY CONTROL**

- A. Motor Tests:
  1. Test motors in accordance with NEMA and IEEE standards.
  2. Provide routine test for all motors.
  3. The Owner reserves the right to select and have tested, either routine or complete, any motor included in the project.
    - a. The Owner will pay all costs, including shipping and handling, for all motors successfully passing the tests.
    - b. The Contractor shall pay all costs, including shipping and handling, for all motors failing the tests.
    - c. If two (2) successive motors of the same manufacturer fail testing, the Owner has the right to reject all motors from that manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install equipment as shown on Drawings and in accordance with manufacturer's directions.
- B. Utilize templates for anchorage placement for slab-mounted equipment.
- C. For equipment having drainage requirements such as seal water, provide 3/4 IN PVC or clear plastic tubing from equipment base to nearest floor or equipment drain.
  - 1. Route clear of major traffic areas and as approved by Engineer.
- D. DO NOT construct foundations until major equipment supports are approved.
- E. Extend all non-accessible grease fittings using stainless steel tubing to a location which allows easy access of fittings from closest operating floor level.
- F. Equipment Base:
  - 1. Construct level in both directions.
  - 2. Take particular care at anchor bolt locations so these areas are flat and level.
- G. Machine Base:
  - 1. Mount machine base of rotating equipment on equipment base.
    - a. Level in both directions, using a machinist level, according to machined surfaces on base.
  - 2. Level machine base on equipment base and align couplings between driver and driven unit using steel blocks and shims.
    - a. Size blocks and shims to provide solid support at each mounting bolt location.
      - 1) Provide area size of blocks and shims approximately 1-1/2 times area support surface at each mounting bolt point.
    - b. Provide blocks and shims at each mounting bolt.
      - 1) Furnish blocks and shims that are square shape with "U" cut out to allow blocks and shims to be centered on mounting bolts.
    - c. After all leveling and alignment has been completed and before grouting, tighten mounting bolts to proper torque value.
- H. Rotating equipment Couplings:
  - 1. Align in the annular and parallel positions.
    - a. For equipment rotating at 1200 rpm or less, align both annular and parallel within 0.001 IN tolerance for couplings 4 IN size and smaller.
    - b. Couplings larger than 4 IN size: Increase tolerance 0.0005 IN per inches of coupling diameter, i.e., allow 6 IN coupling 0.002 IN tolerance, and allow a 10 IN coupling 0.004 IN tolerance.
    - c. For equipment rotating at speeds greater than 1200 rpm allow both annular and parallel positions within a tolerance rate of 0.00025 IN per inch coupling diameter.
  - 2. If equipment is delivered as a mounted unit from factory, verify factory alignment on site after installation and realigned if necessary.
  - 3. Check surfaces for runout before attempting to trim or align units.
- I. Grouting:
  - 1. After machine base has been shimmed, leveled onto equipment base, couplings aligned and mounting bolts tightened to correct torque value, place a dam or formwork around base to contain grouting between equipment base and equipment support pad.
    - a. Extend dam or formwork to cover leveling shims and blocks.
    - b. Do not use nuts below the machine base to level the unit.
  - 2. Saturate top of roughened concrete subbase with water before grouting.
    - a. Add grout until entire space under machine base is filled to the top of the base underside.
    - b. Puddle grout by working a stiff wire through the grout and vent holes to work grout in place and release any entrained air in the grout or base cavity.

3. When the grout has sufficiently hardened, remove dam or formwork and finish the exposed grout surface to fine, smooth surface.
  - a. Cover exposed grout surfaces with wet burlap and keep covering sufficiently wet to prevent too rapid evaporation of water from the grout.
  - b. When the grout has fully hardened (after a minimum of seven (7) days) tighten all anchor bolts to engage equipment base to grout, shims, and equipment support pad.
  - c. Recheck driver-driven unit for proper alignment.

### **3.2 INSTALLATION CHECKS**

- A. For all equipment specifically required in detailed specifications, secure services of experienced, competent, and authorized representative(s) of equipment manufacturer to visit site of work and inspect, check, adjust and approve equipment installation.
  1. In each case, representative(s) shall be present during placement and start-up of equipment and as often as necessary to resolve any operational issues which may arise.
- B. Secure from equipment manufacturer's representative(s) a written report certifying that equipment:
  1. Has been properly installed and lubricated.
  2. Is in accurate alignment.
  3. Is free from any undue stress imposed by connecting piping or anchor bolts.
  4. Has been operated under full load conditions and that it operated satisfactorily.
    - a. Secure and deliver a field written report to Owner immediately prior to leaving jobsite.
- C. No separate payment shall be made for installation checks.
  1. All or any time expended during installation check does not qualify as Operation and Maintenance training or instruction time when specified.

### **3.3 IDENTIFICATION OF EQUIPMENT AND HAZARD WARNING SIGNS**

- A. Identify equipment and install hazard warning signs in accordance with Specification Section 10 14 00.

### **3.4 WIRING CONNECTIONS AND TERMINATION**

- A. Clean wires before installing lugs and connectors.
- B. Coat connection with oxidation eliminating compound for aluminum wire.
- C. Terminate motor circuit conductors with copper lugs bolted to motor leads.
- D. Tape stripped ends of conductors and associated connectors with electrical tape.
  1. Wrapping thickness shall be 150 percent of the conductor insulation thickness.
- E. Connections to carry full ampacity of conductors without temperature rise.
- F. Terminate spare conductors with electrical tape.

### **3.5 FIELD QUALITY CONTROL**

- A. General:
  1. Furnish equipment manufacturer's field quality control services and testing as specified in the individual equipment Specification Sections.
  2. Perform and report on all tests required by the equipment manufacturer's Operation and Maintenance Manual.
  3. Provide testing of electrical equipment and connections in accordance with the Electrical specifications.
  4. Equip testing and analysis personnel with all appropriate project related reference material required to perform tests, analyze results, and provide documentation including, but not limited to:
    - a. Contract Drawings and Specifications.
    - b. Related construction change documentation.
    - c. Approved Shop Drawings.



- d. Approved Operation and Maintenance Manuals.
  - e. Other pertinent information as required.
- B. Equipment Monitoring and Testing Plans:
  - 1. Approved in accordance with Shop Drawing submittal schedule.
  - 2. Included as a minimum:
    - a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
    - b. List and description of testing and analysis equipment to be utilized.
    - c. List of all equipment to be testing, including:
      - 1) Name and tag numbers identified in the Contract Documents.
      - 2) Manufacturer's serial numbers.
      - 3) Other pertinent manufacturer identification,
- C. Instruments Used in Equipment and Connections Quality Control Testing:
  - 1. Minimum calibration frequency:
    - a. Field analog instruments: Not more than 6 months.
    - b. Field digital instruments: Not more than 12 months.
    - c. Laboratory instruments: Not more than 12 months.
    - d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
  - 2. Carry current calibration status and labels on all testing instruments.
  - 3. See individual testing programs for additional instrumentation compliance requirements.
- D. Testing and Monitoring Program Documentation:
  - 1. Provide reports with tabbed sections for each piece of equipment tested.
  - 2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
    - a. Include legible copies of all forms used to record field test information.
  - 3. Prior to start of testing, submit one (1) copy of preliminary report format for Engineer review and comment
    - a. Include data gathering and sample test report forms that will be utilized.
  - 4. In the final report, include as a minimum, the following information for all equipment tested:
    - a. Equipment identification, including:
      - 1) Name and tag numbers identified in the Contract Documents.
      - 2) Manufacturer's serial numbers.
      - 3) Other pertinent manufacturer identification,
    - b. Date and time of each test.
    - c. Ambient conditions including temperature, humidity, and precipitation.
    - d. Visual inspection report.
    - e. Description of test and referenced standards, if any, followed while conducting tests.
    - f. Results of initial and all retesting.
    - g. Acceptance criteria.
    - h. "As found" and "as left" conditions.
    - i. Corrective action, if required, taken to meet acceptance.
    - j. Verification of corrective action signed by the Contractor, equipment supplier, and Owner's representative.
    - k. Instrument calibration dates of all instruments used in testing.
  - 5. Provide three (3) bound final reports prior to Project final completion.

## END OF SECTION



**SECTION 01 65 50**  
**PRODUCT DELIVERY, STORAGE, AND HANDLING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Scheduling of product delivery.
  - 2. Packaging of products for delivery.
  - 3. Protection of products against damage from:
    - a. Handling.
    - b. Exposure to elements or harsh environments.
- B. Payment:
  - 1. No payment will be made to Contractor for equipment or materials not properly stored and insured or without approved Shop Drawings.
    - a. Previous payments for items will be deducted from subsequent progress estimate(s) if proper storage procedures are not observed.

**1.2 DELIVERY**

- A. Scheduling: Schedule delivery of products or equipment as required to allow timely installation and to avoid prolonged storage.
- B. Packaging: Deliver products or equipment in manufacturer's original unbroken cartons or other containers designed and constructed to protect the contents from physical or environmental damage.
- C. Identification: Clearly and fully mark and identify as to manufacturer, item, and installation location.
- D. Protection and Handling: Provide manufacturer's instructions for storage and handling.

**PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)**

**PART 3 - EXECUTION**

**3.1 PROTECTION, STORAGE AND HANDLING**

- A. Manufacturer's Instruction:
  - 1. Protect all products or equipment in accordance with manufacturer's written directions.
    - a. Store products or equipment in location to avoid physical damage to items while in storage.
    - b. Handle products or equipment in accordance with manufacturer's recommendations and instructions.
  - 2. Protect equipment from exposure to elements and keep thoroughly dry.
  - 3. When space heaters are provided in equipment, connect and operate heaters during storage until equipment is placed in service.

**3.2 STORAGE FACILITIES**

- A. Temporary Storage Building:
  - 1. Provide a weatherproof temporary storage building specifically for the purpose of providing for protection of products and equipment.
    - a. Size building to accommodate anticipated storage items; however, not less than 20 FT x 20 FT.

2. Equip building with lockable doors and lighting, and provide electrical service for equipment space heaters and heating or ventilation as necessary to provide storage environments acceptable to specified manufacturers.
3. Provide methods of storage of products and equipment off the ground.
4. Provide this structure within 60 days after Notice to Proceed.
  - a. Locate building on-site where shown on the Drawings or in location approved by Engineer.
  - b. Remove building from site prior to startup and demonstration period.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspect Deliveries:
  1. Inspect all products or equipment delivered to the site prior to unloading.
    - a. Reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on Project.
- B. Monitor Storage Area: Monitor storage area to ensure suitable temperature and moisture conditions are maintained as required by manufacturer or as appropriate for particular items.

### **END OF SECTION**

**SECTION 01 73 20**  
**OPENINGS AND PENETRATIONS IN CONSTRUCTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Methods of installing and sealing openings and penetrations in construction.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. American Concrete Institute (ACI):
    - a. 318, Building Code Requirements for Structural Concrete.
  2. ASTM International (ASTM):
    - a. A36, Standard Specification for Carbon Structural Steel.
    - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - c. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
    - d. A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
    - e. A351, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
    - f. A554, Standard Specification for Welded Stainless Steel Mechanical Tubing.
    - g. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
    - h. A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
    - i. A995, Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts.
  3. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC):
      - 1) Article 501, Class 1 Locations.
    - b. 90A, Standard for Installation of Air Conditioning and Ventilating Systems.
    - c. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

**1.3 DEFINITIONS**

- A. Hazardous Areas: Areas shown in the Contract Documents as having Class I or Class II area classifications.
- B. Washdown Areas: Areas having floor drains or hose bibs.

**1.4 SUBMITTALS**

- A. Shop Drawings:
1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  2. For each structure provide dimensioned or scaled (minimum 1/8 IN = 1 FT) plan view drawings containing the following information:
    - a. Vertical and horizontal location of all required openings and penetrations.
    - b. Size of all openings and penetrations.
    - c. Opening type.
    - d. Seal type.
  3. Manufacturer's installation instructions for standard manufactured products.

## **1.5 PROJECT CONDITIONS**

- A. For purposes of this Project, water table level is at grade.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Pipe Sleeves and Sheet Metal Sleeves:
  - 1. Areas listed as Corrosive Areas in PART 1:
    - a. Stainless steel, Type 316L.
  - 2. All other Areas:
    - a. Stainless steel, type 316L.
- B. Backing Rod and Sealant: See Specification Section 07 92 00.
- C. Modular Mechanical Seals:
  - 1. Acceptable manufacturers:
    - a. Link-Seal.
  - 2. 316 stainless steel bolts, nuts and washers.

## **PART 3 - EXECUTION**

### **3.1 FABRICATION**

- A. Fabricate pipe sleeves in accordance with Specification Section 05 50 00.
- B. Provide waterstop plate/anchor flange for piping, ducts, castings and sleeves cast-in-place in concrete.
  - 1. For fabricated units, weld plate to sleeve, pipe, or ductwork.
  - 2. For commercial castings, cast water stop/anchor with wall pipe.
  - 3. Plate is to be same thickness as sleeve, pipe, casting or ductwork.
  - 4. For fabricated units, diameter of plate or flange to be 4 IN larger than outside diameter of sleeve, pipe or ductwork.
  - 5. For commercial castings, waterstop/anchor size to be manufacturer standard.
  - 6. Provide continuous around entire circumference of sleeve, pipe, or ductwork.
- C. Factory or shop-coat painted components in accordance with Specification Section 09 96 00.

### **3.2 INSTALLATION AND APPLICATION**

- A. Seal openings and penetrations in non-fire-resistance-rated construction in accordance with Specification Section 07 92 00.
- B. Obtain prior approval from Engineer when any opening larger than 100 SQ IN must be made in existing or newly completed construction.
- C. Perform HVAC penetrations in accordance with NFPA 90A.
- D. Perform electrical penetrations in accordance with NFPA 70, Article 501.
- E. Install sleeves and castings in accordance with ACI 318, Chapter #6.
- F. When mechanical or electrical work cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, insets, fixtures or devices necessary to permit installation later.
  - 1. Lay out chases, holes or other openings which must be provided in masonry, concrete or other work.
- G. Where pipes, conduits or ducts pass through floors in washdown areas, install sleeves with top 3 IN above finish floors.
  - 1. In non-washdown areas, install sleeves with ends flush with finished surfaces.

- H. Size sleeves, blockouts and cutouts which will receive sealant seal such that free area to receive sealant is minimized and seal integrity may be obtained.
- I. For insulated piping and ducts, size sleeves, blockouts and cutouts large enough to accommodate full thickness of insulation.
- J. Where pipes, conduits or ducts pass through grating, provide banding at the entire perimeter of the opening.
  - 1. Metal grating: See Specification Section 05 50 00.
- K. Where pipes, conduits or ducts are removed where passing through grating:
  - 1. Metal grating:
    - a. Provide banding at perimeter and cover opening with 1/4 IN plate of the same material of the grating.
    - b. See Specification Section 05 50 00.
- L. Do not cut into or core drill any beams, joists, or columns.
- M. Do not install sleeves in beams, joists, or columns.
- N. Do not install recesses in beams, joists, columns, or slabs.
- O. Field Cutting and Coring:
  - 1. Saw or core drill with non-impact type equipment.
  - 2. Mark opening and drill small 3/4 IN or less holes through structure following opening outline.
  - 3. Sawcut opening outline on both surfaces.
    - a. Knock out within sawcuts using impact type equipment.
    - b. Do not chip or spall face of surface to remain intact.
    - c. Do not allow any overcut with saw kerf.
- P. Precast-Prestressed Concrete Construction:
  - 1. Do not cut openings or core drill vertically or horizontally through stems of members.
  - 2. Do not locate or install sleeves or recess sleeves vertically or horizontally through or in stems of members.
  - 3. Cast openings and sleeves into flanges of units.
  - 4. Cast openings larger than 6 IN in diameter or 6 IN maximum dimension in units at time of manufacture.
  - 5. Cast openings smaller than 6 IN in diameter or 6 IN maximum dimensions in flanges of units at time of manufacture or field cut.
- Q. Where alterations are necessary or where new and old work join, restore adjacent surfaces to their condition existing prior to start of work.
- R. Where area is blocked out to receive sheet metal sleeve at later date:
  - 1. If blockout size is sufficient to allow placement, utilize dowels for interface of initially placed concrete and sleeve encasement concrete which is placed later.
    - a. Size blockout based on sleeve size required plus 4 to 6 IN each side of sleeve for concrete encasement.
    - b. Provide #4 dowels at 12 IN spacing along each side of blockout with minimum of two (2) dowels required per side.
  - 2. If blockout size is not sufficient to allow placement of dowels, provide keyway along all sides of blockout.
    - a. Size blockout based on sleeve size required plus 2 to 4 IN each side of sleeve for concrete encasement.
- S. For interior wall applications where backer rod and sealant are specified, provide backer rod and sealant at each side of wall.
- T. Use full depth expanding foam sealant for seal applications where single or multiple pipes, conduits, etc., pass through a single sleeve.

- U. Do not make duct or conduit penetrations below high water levels when entering or leaving tankage, wet wells, or other water holding structures.
- V. Modular Mechanical Seals:
  - 1. Utilize one (1) seal for concrete thickness less than 8 IN and two (2) seals for concrete, 8 IN thick or greater.
  - 2. Utilize two (2) seals for piping 16 IN diameter and larger if concrete thickness permits.
  - 3. Install seals such that bolt heads are located on the most accessible side of the penetration.
- W. Backer Rod and Sealant:
  - 1. Install in accordance with Specification Section 07 92 00.
  - 2. Provide backer rod and sealant for modular mechanical seal applications.
    - a. Apply on top side of slab penetrations and on interior, dry side wall penetrations.

### 3.3 SCHEDULES

- A. General Schedule of Penetrations through Floors, Roofs, Foundation Base Slabs, Foundation Walls, Foundation Footings, Partitions and Walls for Ductwork, Piping, and Conduit:
  - 1. Provide the following opening and penetration types:
    - a. Type A - Block out 2 IN larger than outside dimensions of duct, pipe, or conduits.
    - b. Type B - Saw cut or line-drill opening. Place new concrete with integrally cast sheet metal or pipe sleeve.
    - c. Type C - Fabricated sheet metal sleeve or pipe sleeve cast-in-place. Provide pipe sleeve with water ring for wet and/or washdown areas.
    - d. Type D - Commercial type casting or fabrication.
    - e. Type E - Saw cut or line-drill opening. Place new concrete with integrally cast pipe, duct or conduit spools.
    - f. Type F - Integrally cast pipe, duct or conduit.
    - g. Type G - Saw cut or line-drill and remove area 1 IN larger than outside dimensions of duct, pipe or conduit.
    - h. Type H - Core drill.
    - i. Type I - Block out area. At later date, place new concrete with integrally cast sheet metal or pipe sleeve.
    - j. Type J- Grating Banding for any field cut openings
  - 2. Provide seals of material and method described as follows.
    - a. Category 1 - Modular Mechanical Seal.
    - b. Category 2 - Roof curb and flashing according to SMACNA specifications unless otherwise noted on Drawings. Refer to Specification Section 07 62 00 and roofing Specification Sections for additional requirements.
    - c. Category 3 - 12 GA sheet metal drip sleeve set in bed of silicon sealant with backing rod and sealant used in sleeve annulus.
    - d. Category 4 - Backer rod and sealant.
    - e. Category 5 - Full depth compressible sealant with escutcheons on both sides of opening.
    - f. Category 6 - Full depth compressible sealant and flanges on both sides of opening. Flanges constructed of same material as duct, fastened to duct and minimum 1/2 IN larger than opening.
    - g. Category 7 - Full depth compressible sealant and finish sealant or full depth expanding foam sealant depending on application.
    - h. Category 8- Banding for all grating openings and banding and cover plate of similar materials for abandoned openings
  - 3. Furnish openings and sealing materials through new floors, roofs, grating, partitions and walls in accordance with Schedule A, Openings and Penetrations for New Construction.
  - 4. Furnish openings and sealing materials through existing floors, grating, roofs, partitions and walls in accordance with Schedule B, Openings and Penetrations for Existing Construction.

#### **SCHEDULE A. OPENINGS AND PENETRATIONS SCHEDULE FOR NEW CONSTRUCTION**



APPLICATIONS	DUCTS		PIPING		CONDUIT	
	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY
Through floors on grade above water table	C F I	4 Not Req 4	C F I <sup>(1)</sup>	7 Not Req 7	C F I <sup>(1)</sup>	4 Not Req 7
Through slab on grade below water table	F	Not Req	F	Not Req	F	Not Req
Through exterior wall below grade above water table	C F I	7 Not Req 7	C D F I <sup>(1)</sup>	1 Not Req Not Req 1	F I <sup>(1)</sup>	Not Req 7
Through exterior wall above grade	A B C	6 6 6	A B D H <sup>(2)</sup>	5 5 Not Req 5	C H <sup>(2)</sup>	5 4
Roof penetrations	A	2	A	2	A	2
Through interior walls and slabs not covered by the above applications	A C	4 4	A C	4 4	A C F	4 4 Not Req
Grating openings and penetrations	J	8	J	8	J	8

**SCHEDULE B. OPENINGS AND PENETRATIONS SCHEDULE  
FOR EXISTING CONSTRUCTION**

APPLICATIONS	DUCTS		PIPING		CONDUIT	
	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY
Through exterior wall below grade above water table	B	7	B <sup>(1)</sup> B <sup>(3)</sup> H <sup>(2)</sup>	7 1 7	B <sup>(1)(3)</sup> H <sup>(2)</sup>	7 7

- (1) Multiple piping 3 IN and smaller or multiple conduits.  
(2) Single pipe 3 IN and smaller or single conduit.  
(3) Single pipe or conduit larger than 3 IN.

**END OF SECTION**



**SECTION 01 73 29**  
**DEMOLITION, CUTTING AND PATCHING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Demolition, cutting and patching of existing construction where shown on Drawings, or as required to accommodate new work shown or specified.

**1.2 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Indicating manufacturer and type of:
    - a. Proposed nonshrink grout.
    - b. Epoxy bonding adhesive.
    - c. Proposed materials and methods to be used for matching and repairing existing construction.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. General:
  - 1. Salvage items, designated for Owner's salvage, as a functional unit.
  - 2. Clean, list and tag for storage.
  - 3. Protect from damage and deliver to location designated.
  - 4. Salvage each item with auxiliary or associated equipment required for operation.

**1.4 PROJECT CONDITIONS**

- A. Perform preliminary investigations as required to ascertain extent of work.

**1.5 SEQUENCING AND SCHEDULING**

- A. Coordinate and reschedule work as required to preclude interference with other operations.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:
  - 1. Nonshrink grout:
    - a. Supreme Grout by Gifford Hill.
    - b. Masterflow 713 Plus by BASF Building Systems.
    - c. Sika Grout 212 by Sika.
  - 2. Epoxy bonding adhesive:
    - a. Euco No.452 MV by Euclid Chemical Co.
    - b. Sikadur 32, Hi-Mod by Sika Corporation.

**2.2 MATERIALS**

- A. Temporary Partitions:
  - 1. Plywood: 1/2 IN minimum for interior or exterior use.
  - 2. Paneling: 1/4 IN minimum for interior use.

- B. Nonshrink Grout:
  - 1. Nonmetallic, noncorrosive and nonstaining.
  - 2. Premixed with only water to be added in accordance with manufacturer's instructions at jobsite.
  - 3. Grout to produce a positive but controlled expansion. Mass expansion not to be created by gas liberation or by other means.
  - 4. Minimum compressive strength at 28 days to be 6500 psi.
  - 5. Coat exposed edges of grout with a cure/seal compound recommended by grout manufacturer.
- C. Epoxy Bonding Adhesive:
  - 1. Two component, moisture insensitive adhesive manufactured for the purpose of bonding fresh concrete to hardened concrete.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Provide temporary partitions as required in public areas.
  - 1. Construct partitions of braced plywood in exterior areas.
  - 2. Adequately braced paneling may be used in interior areas.
- B. Provide covered passageways where necessary to ensure safe passage of persons in or near areas of work.
- C. Provide substantial barricades and safety lights as required.
- D. Provide temporary dustproof partitions where indicated or necessary.
  - 1. Prevent infiltration of dust into occupied areas.
- E. Provide temporary weather protection as necessary.

### **3.2 INSTALLATION**

- A. Cutting and Removal:
  - 1. Remove existing work indicated to be removed, or as necessary for installation of new work.
  - 2. Neatly cut and remove materials, and prepare all openings to receive new work.
  - 3. Remove masonry or concrete in small sections.
- B. Modification of Existing Concrete:
  - 1. Where indicated, remove existing concrete and finish remaining surfaces as specified in Section 03 09 00.
    - a. Protect remaining concrete from damage.
    - b. Make openings by sawing through the existing concrete.
    - c. Concrete may be broken out after initial saw cuts in the event concrete thickness prevents cutting through.
    - d. Where sawing is not possible, make openings by drilling holes around perimeter of opening and then chipping out the concrete.
      - 1) Holes shall be sufficient in number to prevent damage to remaining concrete.
  - 2. Oversize required openings in existing concrete 1 IN on all sides and build back to required opening size by means of nonshrink grout epoxy bonded to the existing concrete.
  - 3. Where oversized openings cannot be made, remove the concrete to the required opening size and cut back exposed reinforcing 1 IN from face of concrete and fill resulting holes with nonshrink grout.
- C. Removal of Existing Anchor Bolts or Other Protruding Elements:
  - 1. Removal within a distance of 8 FT above finished floor or operating level elevation.
  - 2. Removed to a depth of 1/2 IN from finished surface.

3. Fill void with non-shrink grout.
- D. Matching and Patching:
1. Walls, ceilings, floors or partitions:
    - a. Repair abutting walls, ceilings, floors or partitions disturbed by removal.
    - b. Match and patch existing construction disturbed during installation of new work.
  2. Methods and materials:
    - a. Similar in appearance, and equal in quality to adjacent areas for areas or surfaces being repaired.
    - b. Subject to review of Engineer.
- E. Salvaged Items:
1. Thoroughly dry and clean all metal surfaces.
  2. Clean and lubricate motors and other moving parts.
  3. Brace motors attached to flexible mountings until reinstallation.
  4. Dispose of items or materials not designated for Owner's salvage or reuse. Promptly remove from site.
  5. Do not store or sell Contractor salvaged items or materials on site.
- F. Clean Up:
1. Transport debris and legally dispose of off site.

**END OF SECTION**



## **SECTION 01 74 13**

### **CLEANING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Intermediate and final cleaning of Work not including special cleaning of closed systems specified elsewhere.

##### **1.2 STORAGE AND HANDLING**

- A. Store cleaning products and cleaning wastes in containers specifically designed for those materials.

##### **1.3 SCHEDULING**

- A. Schedule cleaning operations so that dust and other contaminants disturbed by cleaning process will not fall on newly painted surfaces.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Cleaning Agents:
  - 1. Compatible with surface being cleaned.
  - 2. New and uncontaminated.
  - 3. For Manufactured Surfaces: Material recommended by manufacturer.

#### **PART 3 - EXECUTION**

##### **3.1 CLEANING - GENERAL**

- A. Prevent accumulation of wastes that create hazardous conditions.
- B. Conduct cleaning and disposal operations to comply with laws and safety orders of governing authorities.
- C. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains or sewers.
- D. Dispose of degradable debris at an approved solid waste disposal site.
- E. Dispose of nondegradable debris at an approved solid waste disposal site or in an alternate manner approved by Engineer and regulatory agencies.
- F. Handle materials in a controlled manner with as few handlings as possible.
- G. Do not drop or throw materials from heights greater than 4 FT or less than 4 FT if conditions warrant greater care.
- H. On completion of work, leave area in a clean, natural looking condition.
  - 1. Remove all signs of temporary construction and activities incidental to construction of required permanent Work.
- I. Do not burn on-site.

##### **3.2 INTERIOR CLEANING**

- A. Cleaning During Construction:

1. Keep work areas clean so as not to hinder health, safety or convenience of personnel in existing facility operations.
  2. At maximum weekly intervals, dispose of waste materials, debris, and rubbish.
  3. Vacuum clean interior areas when ready to receive finish painting.
    - a. Continue vacuum cleaning on an as-needed basis, until substantial completion.
- B. Final Cleaning:
1. Complete immediately prior to Demonstration Period.
  2. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed surfaces.
  3. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.
  4. Wash and shine glazing and mirrors.
  5. Polish glossy surfaces to a clear shine.
  6. Ventilating systems:
    - a. Clean permanent filters and replace disposable filters if units were operated during construction.
    - b. Clean ducts, blowers and coils if units were operated without filters during construction.
  7. Replace all burned out lamps.
  8. Broom clean process area floors.
  9. Mop office and control room floors.

### **3.3 EXTERIOR (SITE) CLEANING**

- A. Cleaning During Construction:
1. Construction debris:
    - a. Confine in strategically located container(s):
      - 1) Cover to prevent blowing by wind.
      - 2) Haul from site minimum once a week.
    - b. Remove from work area to container daily.
  2. Vegetation: Keep weeds and other vegetation trimmed to 3 IN maximum height.
  3. Soils, sand, and gravel deposited on paved areas and walks:
    - a. Remove as required to prevent muddy or dusty conditions.
    - b. Do not flush into storm sewer system.
- B. Final Cleaning:
1. Remove trash and debris containers from site.
    - a. Re-seed areas disturbed by location of trash and debris containers.
  2. Clean paved roadways.

### **3.4 FIELD QUALITY CONTROL**

- A. Immediately prior to Demonstration Period, conduct an inspection with Engineer to verify condition of all work areas.

## **END OF SECTION**



## **SECTION 01 81 10**

### **SEISMIC DESIGN CRITERIA**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This Section is intended to be used for all aspects of this project. When there are conflicts between this Section and other seismic design criteria given in the Contract Documents, the more stringent loading shall control unless clarified in writing during the Bid phase. Obtain clarification of all conflicts in writing prior to construction.
- B. Section Includes:
  - 1. The seismic design criteria for this project including all items directly specified in the Contract Documents as well as all items that are specified to be designed by the Contractor and submitted for approval. Items include but are not necessarily limited to the following:
    - a. Anchorage of mechanical and electrical equipment.
    - b. Anchorage of pipe support structures.
    - c. Other structures or items as specified or indicated in the Contract Documents.

##### **1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Society of Civil Engineers (ASCE):
    - a. 7-10, Minimum Design Loads for Buildings and Other Structures.
  - 2. International Code Council (ICC):
    - a. California Building Code and associated standards, 2016 Edition including all City of Folsom amendments, referred to herein as Building Code.
  - 3. When referenced standards conflict the most stringent shall apply unless specifically indicated otherwise in the Contract Documents or unless approved otherwise in writing by the Engineer.
- B. Qualifications:
  - 1. Engineer for Contractor designed items: Professional Engineer licensed in the State of California.

##### **1.3 GENERAL DESIGN CRITERIA**

- A. This paragraph is applicable to both wind and seismic design criteria.
- B. Design in accordance with the requirements of the Building Code and all applicable referenced standards.
- C. Risk Category: III.
- D. Design in accordance with the Building Code load combinations for service level or factored level at Contractor's option.
  - 1. Mechanical and electrical equipment loads will be considered dead loads.

##### **1.4 SEISMIC DESIGN CRITERIA**

- A. Seismic Design Load Criteria:
  - 1. Design spectral acceleration at short period:  $S_{DS} = 0.448g$ .
  - 2. Design spectral acceleration at 1-second period:  $S_{D1} = 0.308g$ .
  - 3. Importance Factor:  $I_e = 1.25$ .
  - 4. Seismic Design Category: D.
  - 5. Component or system amplification factor, ( $a_p$ ) and Component response modification factor, ( $R_p$ ): In accordance with ASCE 7-10, Tables 13.5-1 and 13.6-1.
  - 6. Component importance factor:
    - a.  $I_p = 1.50$ .

- B. Seismic forces must be resisted by direct load transfer through fasteners to all seismic resisting elements. Do not use connections that use friction to transfer seismic forces.

## **1.5 SUBMITTALS**

- A. Informational Submittals:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Structural Calculations:
    - a. Submit calculations for each Contractor designed item under the Specification Section number for that item.
    - b. Indicate compliance with specific referenced documents of the Building Code.
    - c. Provide basis of design and lateral analysis as required to derive all loads and to show system stability including compatibility of deflections and compatibility with allowable soil parameters as applicable.
    - d. Indicate design load to each connection.
    - e. Provide a complete lateral load resisting system that transfers all wind and seismic loads through a load path to ground.
    - f. Sealed by a professional engineer licensed in the State the project is located in.

## **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)**

## **PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)**

**END OF SECTION**

**SECTION 02 15 50**  
**TEMPORARY BYPASS PUMPING SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Scope:
1. The Contractor shall furnish all labor, materials, equipment, utilities, and incidentals to design, install and maintain operation of temporary bypass pumping systems for the purpose of diverting the existing flow around work areas as necessary to execute work shown in the contract documents.
  2. The Contractor shall comply with all federal, state and local laws and regulations concerning pollution arising from construction activities.

**1.2 CONTRACTOR QUALIFICATIONS**

- A. The Contractor assigned to fulfill the duties outlined by this Specification shall possess the following minimum qualifications:
1. Specialize in the design and operation of temporary bypass pumping systems.
  2. Contractor shall be regularly engaged in projects of similar size and scope.
  3. Contractor shall provide relatively new and reliable equipment for sewer bypass service.

**1.3 SUBMITTALS**

- A. Submit a temporary pumping plan for approval by the Owner and Construction Manager. The temporary pumping plan shall include, at a minimum, the following:
1. Demonstrate compliance with sequencing constraints identified in Contract Drawings and/or otherwise not noted, but necessary for construction.
  2. Drawings and details showing:
    - a. Proposed intake/suction locations.
    - b. Pump staging areas.
    - c. Pipeline routes, sizes, and discharge locations.
    - d. Number, material, and size of all suction and discharge pipes.
    - e. Pipeline information, including information on:
      - 1) Thrust restraint provisions.
      - 2) Temporary pipe supports, and anchorage.
      - 3) Protection from damage during use.
    - f. Elevation schematic showing elevation, on/off levels for each temporary pump, and static head.
  3. A site plan of each bypass pump system, including:
    - a. Standby generators.
    - b. Protection provisions for both existing operations and temporary systems.
    - c. Pump containment systems to ensure that fuel, where applicable, do not exit the pump staging areas.
  4. Unless otherwise coordinated with Owner, provide information on generator backup power and automatic transfer switch.
  5. System analysis information, including:
    - a. Required static lift, frictional and minor headlosses, pipe velocities, and a system curve based on the actual suction and discharge pipeline configuration.
    - b. Pipe sizing, material, and quantity information for the temporary piping.
    - c. Pump cut sheets and pump curves showing pump capacity and TDH of the proposed system.
    - d. Detail the number of pumps used for regular operation and the pumps provided for redundancy.
  6. Electrical plans (or equivalent for engine driven unit), including:

- a. Panel location.
    - b. Temporary conduit runs.
    - c. Connection to back-up power, etc.
    - d. Manufacturer's information for all electrical equipment.
  7. Submit manufacturer's information on the pump Variable Frequency Drive (VFD). Include a letter from the pump manufacturer stating that the VFD is compatible with the submitted pump.
  8. Temporary alarm systems for bypass pumping systems.
  9. List of names and telephone numbers of the Contractor's personnel that will be notified by the alarm.
  10. Provide a plan detailing out the provisions to maintain operation of the temporary pumping systems in the event of mechanical or electrical failure.
  11. Information on the instrumentation systems that will control the water surface elevation in the pump sumps.
  12. Provide manufacturer's information for all bypass pumping system appurtenances necessary to properly operate and maintain the temporary system.
  13. Product information for sound attenuating materials required to meet local requirements.
  14. Qualification verification information, including:
    - a. Five recent projects of similar size and scope that were completed within the last three years.
    - b. Reference names and current phone numbers of the Owner, Contractor, Engineer, or Construction Manager.
- B. Submit a System Outage Request (SOR) Form for each bypass/outage plan.

## **PART 2 - PRODUCTS**

### **2.1 FLOW REQUIREMENTS**

- A. It is essential to the operation of the treatment plant that no interruptions in the RBW flow occur throughout the duration of the project.
- B. Flow requirements vary depending on the time of year and the time of day. The bypass system must be able to accommodate all flow conditions including and between the minimum and peak flows as summarized on sheet G04 of the drawings..
- C. The bypass system will be operating 24 hours per day.
- D. At no time shall process flow be allowed to back-up in the pipelines to an elevation higher than the Owner-determined high water alarm level in the bypass pump sumps.

### **2.2 BYPASS PUMPS**

- A. Each temporary pumping system shall include at least two pumps, one duty and one standby.
- B. The system shall be capable of providing the maximum specified flow with the largest pump out of service.
- C. Pumps shall be installed in parallel and shall run on a variable frequency drive in order to flow-pace reclaim water based on influent flows required for optimal plant operations.
- D. Level controls in the sump shall interface to VFD controls.
- E. Pump operation shall be fully automatic.
- F. Either submersible or self-priming pumps are acceptable. Pump priming systems that require foot valves or vacuum pumps are not acceptable.
- G. Pumps shall come with all necessary start/stop controls and electrical panel.
- H. Pumping systems shall meet local noise ordinances.
- I. Pumps shall shutdown when the water surface elevation falls below the control range.

### **2.3 STAND-BY POWER**

- A. A back-up power supply will be provided by owner to ensure that the pumping system is continually operational. Coordinate with owner on whether the back-up power supply system available may operate all required pumps to meet pumping rate. If not, contractor must provide the back-up power supply.
- B. An automatic transfer switch shall be provided by the contractor.
- C. The emergency power system must be sized to operate all required pumps to meet the peak pumping rates.
- D. The emergency power system controls must allow the operation of the lead and the lag pumps, but not allow the operation of multiple pumps beyond the emergency power generator's output rating.

### **2.4 TEMPORARY PIPING**

- A. Piping shall be sized for a maximum velocity of 10 feet per second.
- B. Acceptable pipe materials are steel, ductile iron, PVC, and polyethylene.
- C. All joints shall be positive, restrained joints.
- D. Piping and joints shall not leak or show signs of deterioration or rust.
- E. Provide check and isolation valves on the discharge side of each bypass pump.

### **2.5 SYSTEM APPURTENANCES**

- A. A containment area shall be provided around all equipment that utilizes and/or stores fuel to protect the surrounding area from fuel leakage.
- B. Provide all equipment and appurtenances required to operate the bypass pumping system. Appurtenances include but are not limited to electrical control, wiring and panels, instrumentation equipment, controls & wiring, an alarm system notification system, etc.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Delivery, Storage and Handling:
  - 1. Comply with Section 01 65 50.

### **3.2 INSTALLATION**

- A. All equipment associated with the temporary bypass pumping shall be installed in accordance with manufacturer's instructions.

### **3.3 TESTING**

- A. Perform leakage and pressure testing of the bypass pump discharge piping.
- B. Notify Construction Manager 24 hours prior to testing.

### **3.4 INSPECTION AND MAINTENANCE**

- A. The Contractor shall continually inspect the bypass pumping system to ensure the system is operating properly.
- B. The pumps shall be continuously monitored by a qualified mechanic while in operation.
- C. It is the Contractor's responsibility to provide fuel necessary to maintain continuous operation of the temporary bypass pumping system.

### **3.5 BYPASS MONITORING**

- A. Contractor shall have qualified staff on-call, readily available, at all times during the operation of bypass pumping systems, including nights, weekends, and holidays. The Contractor's staff shall attend to any problems that should occur with pumps or bypass piping within one hour of notification or alarm.

**END OF SECTION**

## **SECTION 02 41 00**

### **DEMOLITION**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. General provisions applicable to all demolition and removals.
  - 2. Civil/site demolition and removals.
  - 3. Structural demolition and removals.
  - 4. Mechanical demolition and removals
  - 5. Electrical demolition and removals.
  - 6. Disposal of demolition debris, materials, and equipment.
- B. Scope:
  - 1. Contractor shall provide all labor, materials, equipment, tools, and incidentals as shown, specified and required for demolition, removals, and disposal Work.
  - 2. The Work under this Specifications section includes, but is not necessarily limited to:
    - a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of structural concrete, appurtenances, piping, electrical and mechanical systems and equipment, pavement, curbs, and similar existing materials, equipment, and items.
  - 3. Demolitions and removals indicated in other Specifications sections shall comply with requirements of this Specifications section.
  - 4. Perform demolition Work within areas shown or indicated.
  - 5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition and removals Work.

##### **1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. National Fire Protection Association (NFPA):
    - a. 241, Safeguarding Construction, Alteration, and Demolition Operations.
- B. Regulatory Requirements:
  - 1. Demolition, removals, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T – Demolition), and all other Laws and Regulations.
  - 2. Comply with requirements of authorities having jurisdiction.
- C. Qualifications:
  - 1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician(s) legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.
  - 2. Mechanical Removals: Entity and personnel performing mechanical removals shall be legally qualified to perform work in the jurisdiction where the Site is located.

##### **1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Review procedures under this and other Specifications sections and coordinate the Work that will be performed with or before demolition and removals.

##### **1.4 SUBMITTALS**

- A. Informational Submittals: Submit the following:
  - 1. Procedure Submittals:
    - a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:

- 1) Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.
  - 2) Other proposed procedures as applicable.
  - 3) Equipment proposed for use in demolition operations.
  - 4) Recycling/disposal facility(ies) proposed, including facility owner, facility name, location, and processes. Include copy of appropriate permits and licenses, and compliance status.
  - 5) Planned demolition operating sequences.
  - 6) Detailed schedule of demolition Work in accordance with the Schedule accepted by Engineer.
2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Specifications Section.
  3. Field Quality Control Test Results:
    - a. Results of megger-testing of existing motors to remain Owner's property.
  4. Qualifications Statements:
    - a. Name and qualifications of entity performing electrical removals, including copy of licenses required by authorities having jurisdiction.
    - b. Name and qualifications of entity performing plumbing removals,

## **1.5 SITE CONDITIONS**

- A. Owner makes no representation of condition or structural integrity of area(s) to be demolished or where removals are required by the Contract Documents.

## **PART 2 - PRODUCTS - (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Notification:
  1. Not less than 48 HRS prior to commencing demolition or removal, advise Owner in writing of planned start of demolition Work. Do not start removals without permission of Owner.
  2. Where demolition or removals has potential to affect adjacent properties, and utilities, furnish required notices to owners and occupants of properties, that may be affected by the demolition or removal.
  3. In accordance with Laws and Regulations, furnish to authorities having jurisdiction, including emergency services as necessary, appropriate notices of planned demolition and removals.
  4. Submit to Owner copies of notices furnished to adjacent property owners, occupants, and authorities having jurisdiction.
- B. Protection of Adjacent Areas and Facilities:
  1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties unless allowed by the Contract Documents otherwise allowed in writing by Owner.
  2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
  3. Provide temporary partitions between demolition work areas and areas that will be occupied during demolition and removals. Temporary partitions shall be sturdy, braced plywood in good condition, of dimensions sufficient to adequately screen demolition work from view of occupants, public, and visitors. Maintain temporary partitions in place until demolition and removals work in the subject area is complete or until other Work requires removal of temporary partitions.



4. Provide appropriate temporary barriers, lighting, sidewalk sheds, and other necessary protection.
  5. Repair damage to facilities that are to remain which such damages results from Contractor's operations.
- C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, perform the following:
1. Should unforeseen, unknown, or incorrectly shown or indicated Underground Facilities be encountered, Contractor responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with Owner in keeping services and facilities in operation.
  2. Shutdown of utility services shall be coordinated by Contractor, assisted by Owner as required relative to contacting utility owners.
- D. Remediation:
1. If unanticipated Hazardous Environmental Condition is believed to be encountered during demolition and removals, comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions.

### **3.2 DEMOLITION - GENERAL**

- A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.
- B. Pollution Controls:
1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level.
  2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
  3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions.
- C. Explosives:
1. Explosives are not allowed at the Site. Do not use explosives for demolition and removal Work.
- D. Salvage and Ownership:
1. Materials and equipment to remain Owner's property shall be:
    - a. Carefully removed and appropriately handled by Contractor to avoid damage and invalidation of warranties in effect. Brace motors attached to flexible mountings until reinstallation or delivery to Owner's storage location. Fully remedy to pre-construction condition or replace items damaged during removal or handling by Contractor.
    - b. Removed as functional units, together with all appurtenances required for operation.
    - c. Cleaned, listed, and tagged for storage.
    - d. Protected from damage.
    - e. Delivered to designated storage location at the Site or other site indicated in the Contract Documents, at place designated by Engineer or Owner.
  2. Preparation of Owner's existing equipment for storage:
    - a. Where appropriate, identify each component with markings or tags to indicate its position in the assembly and the assembly of which it is part.
    - b. Place small parts in appropriate, durable boxes and clearly mark contents on the outside of box or container.
    - c. Remove oil from oil-lubricated bearings and gear boxes and replace with storage oil.
    - d. Grease grease-lubricated bearings.
    - e. Replace breather plugs with solid plugs.
    - f. Megger-test motor windings: Attach report of the test results to the associated motor and submit copy to Owner.
    - g. Attach unit to suitable crate bottom.

- h. Enclose unit in polyethylene film and seal all seams and the film to the base of the unit with tape.
  - i. Construct crate of wood slats around top and sides of unit.
  - j. Attach permanent instruction tag to outside of crate stating "This unit has been prepared for storage. Replace oil, vent plugs, and lubricant in accordance with manufacturer's instructions before start-up."
- E. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by Owner.

### **3.3 STRUCTURAL/CIVIL REMOVALS**

- A. Remove structural/civil items to lines and grades shown or indicated, unless otherwise directed by Owner. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at Contractor's risk and expense and such excess removals shall be reconstructed to satisfaction of Owner without additional cost to Owner.
- B. Recycling and Reuse of Demolition Materials:
- 1. All concrete, reinforcing steel, structural metals, miscellaneous metals, wire mesh, and other items contained in elements to be demolished shall be removed, transported, and disposed of away from the Site, unless otherwise approved by Owner.
  - 2. Do not use demolished materials as fill or backfill adjacent to structures, in pipeline trenches, or as subbase under structures or pavement.
- C. After removing pavement and concrete or portions thereof, mats, slabs, and similar construction that ties in to the Work or to existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.
- D. Where parts of existing structures are to remain in service following demolition, remove the portions shown or indicated for removal, repair damage, and leave the building or structure in proper condition for the intended use.
- 1. Remove pavement and concrete to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended.
  - 2. Do not damage reinforcing bars beyond the area of pavement and concrete removal. Do not saw-cut beyond the area to be removed.
  - 3. Reinforcing bars that are exposed at surfaces of removed concrete that will not be covered with new concrete shall be removed to 1.5 IN below the final surface. Repair the resulting hole, with repair mortar for concrete, to be flush with the surface.
  - 4. Where existing reinforcing bars are shown or indicated to extend into new construction, remove existing concrete so that reinforcing bars are clean and undamaged.
- E. Removal of Anchorages and Protruding Metals:
- 1. Where equipment or material anchored to concrete are removed and anchors are not to be re-used, and where existing metals (and to be removed) protrude from concrete, remove the anchors and other metal to not less than 1.5 IN beneath surface of concrete. Repair the resulting hole, using repair mortar for concrete, to be flush with the surface.
  - 2. Alternately, when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete, when so approved by Owner.
- F. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Specifications section, unless specified elsewhere in the Contract Documents.

### **3.4 MECHANICAL REMOVALS**

- A. Mechanical demolition and removal Work includes dismantling and removing existing:

1. Piping systems systems.
  2. Mechanical equipment and appurtenances.
  3. Mechanical elements of instrumentation and control systems, such as sensors and transmitters and similar items.
  4. Mechanical removals as required herein apply to systems exposed to view, hidden from view, and Underground Facilities. Mechanical removals may require work in spaces that may be classified confined spaces.
- B. Demolition and Removals of Piping, and Similar Items:
1. Scope:
    - a. Safety purge piping and tanks (as applicable) of chemicals, fuel, solids, liquids, and gases (as applicable) and make safe for removal and capping. Discharge contents of existing piping appropriately while avoiding damaging property; restricting access to or use of property; and cresting unsafe, unsanitary, nuisances, and noisome conditions.
    - b. To the extent shown or indicated, remove existing piping conveying water (potable and non-potable), waste and vent, fuel (liquids and gases), heating fluids (such as water-glycol solutions), chemicals, solids and slurries, sludge, wastewater, other fluids, and processes gases, and other piping.
    - c. Remove piping to the nearest structurally sound (or “solid”) piping support, and provide caps on ends of remaining piping.
    - d. Where piping to be demolished passes through existing walls to remain, cut off and cap pipe on each side of the wall.
  2. Caps, Closures, Blind Flanges, and Plugs – General (All Piping):
    - a. Provide closure pieces, such as blind flanges and caps, where shown or required to complete the Work.
    - b. Where used in this Specifications section, the term “cap” means the appropriate type closure for the piping being closed, including caps, blind flanges, and other closures.
    - c. Caps shall be compatible with the piping on which the cap is installed, fluid-tight and gastight, and appropriate for the fluid or gas conveyed in the pipe.
    - d. Unless otherwise shown or indicated, caps shall be mechanically fastened, fused, or welded to pipe. Plug piping with means other than specified in this Specifications section only when expressly so shown or indicated in the Contractor Documents or when allowed by Owner.
  3. Underground Facilities:
    - a. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.
  4. Potable Water Piping:
    - a. Modifications to potable water piping shall comply with Laws and Regulations.
    - b. All portions of potable water systems that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing and piping systems.
- C. Equipment Demolition and Removals:
1. To the extent shown or indicated and as required for the Work, remove existing mechanical equipment, including (but not limited to):
    - a. Flow control gates and valves.
    - b. Pumps.
    - c. Appurtenances (including motors, drive systems, controls, cooling water and seal water systems) as shown, indicated, and required for completion of the Work.
  2. Where required, disassemble equipment to avoid imposing excessive loading on supporting walls, floors, framing, facilities, and Underground Facilities. Disassemble equipment as required for access through and egress from building or structure. Disassembly and removal shall comply with Laws and Regulations. Provide required means to remove equipment from building or structure.
  3. Remove control panels, operator stations, and instruments associated with equipment being removed, unless shown or indicated otherwise.

4. Remove equipment supports as applicable, anchorages, base, grout, and piping. Remove anchorage systems in accordance with the "Structural Removals" Article in this Specifications section.
5. Remove small-diameter piping back to header unless otherwise indicated.
6. Remove access platforms, ladders, and stairs related to equipment being removed, unless otherwise shown or indicated.
7. Instrumentation and Control Systems Removal:
  - a. Remove instrumentation and controls equipment in accordance with this Specifications section's requirements for mechanical removals and electrical removals.
  - b. Comply with this Specifications section's "Disposal of Demolition Debris" Article for restrictions on sales of removed items.

### 3.5 ELECTRICAL REMOVALS

- A. Electrical demolition Work includes removing existing:
  1. Disconnecting cabling from motors, electrical sources, control panels, control stations, instrumentation and control items, and similar devices and equipment.
  2. Conduits, raceways, cable trays, hangers and supports, cabling, and related items.
  3. Switches, panelboards, control stations, and similar items.
  4. Transformers, distribution switchboards, control panels, motors, starters, variable speed controllers, and similar items.
  5. Lighting fixtures and related items.
  6. Utility poles, site lighting standards, and overhead cabling.
  7. Appurtenances and miscellaneous electrical equipment, as shown, specified, or required.
- B. Electrical Removals – General:
  1. Comply with Laws and Regulations, including the National Electric Code.
  2. Lock Out and Tagging:
    - a. Contractor shall lock out and tag circuit breakers and switches operated by Owner and shall verify that affected cabling are de-energized to ground potential before commencing electrical removals Work.
    - b. Upon completion of electrical removals Work, remove the locks and tags and promptly advise Owner that existing facilities are available for use.
  3. Remove existing electrical equipment, fixtures, and systems to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.
  4. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated.
  5. Store removed motors, microprocessors and electronics, and other electrical gear to be reused in accordance with its manufacturer's recommendations and requirements of the Contract Documents.
- C. Motor Control Centers and Switchgear:
  1. Remove or modify motor control centers and switchgear as shown or indicated.
  2. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.
- D. Removal of Cabling, Conduits, Raceways and Similar Items:
  1. Verify the function of each cable before disconnecting and removing.
  2. Remove cabling, conduits, hangers and supports, and similar items back to the power source or control panel, unless otherwise shown or indicated.
  3. Remove cabling, conduits, and similar items where shown or indicated for removal. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to Owner.
  4. Disassemble and remove exposed conduits, junction boxes, other electrical appurtenances, and their supports.
  5. Repair all areas of the Work to prevent rusting on exposed surfaces.

- 6. Underground Electric:
  - a. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.
  - b. Where shown or indicated, remove direct-burial cabling. Openings in buildings for entrance of direct-burial cabling shall be patched with repair mortar or other material approved by Owner for such purpose, and made watertight.
- E. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as Owner's property, shall be removed and properly disposed off-Site as required in accordance with Laws and Regulations.

### **3.6 DEMOLITION OF SITE IMPROVEMENTS**

- A. Pavement, Sidewalks, Curbs, and Gutters:
  - 1. Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
  - 2. To cut pavement, sidewalks, curbs, and gutters, use machinery or tools that provides a smooth-cut edge, appropriate for the required. Where cut edges are not smooth, repair the cut edge to remain to provide a smooth, even appearance.
- B. Guardrails:
  - 1. Remove to the limits shown or indicated on the Drawings.
  - 2. Completely remove below-grade posts and concrete.
- C. Other Site Improvements: When the Contract Documents require removal of other site improvements not addressed above, copy with Contract requirements for removal of buildings or structures.

### **3.7 DISPOSAL OF DEMOLITION DEBRIS**

- A. Disposal – General:
  - 1. Promptly remove from the Site all debris, waste, rubbish, material, and equipment resulting from demolition and removal operations. Promptly upon completion of demolition and removal operations, remove from the Site construction equipment used in demolition Work.
  - 2. Do not sell at the Site demolition materials or removed equipment. If materials, equipment or debris will be sold by Contractor, remove the items from the Site and perform the sale or transaction elsewhere, in accordance with Laws and Regulations.
- B. Transportation and Disposal:
  - 1. Non-Hazardous Materials, Equipment, and Debris: Properly transport and dispose of non-hazardous demolition materials, equipment, and debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Constituents of Concern such as (but not limited to) asbestos, PCBs, petroleum, hazardous waste, radioactive material, or other material designated as hazardous in Laws or Regulations.
  - 2. Hazardous Materials, Equipment, and Debris: When handling and disposal of items containing Constituents of Concern is included in the Work, properly transport and dispose of such items in accordance with the Contract Documents and Laws and Regulations.
- C. Submit to Owner information required in this Specification Section on proposed facility(ies) where demolition materials, equipment, and debris will be recycled. Upon request, Engineer or Owner, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist Engineer and Owner.

## **END OF SECTION**



**SECTION 03 09 00**  
**CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Cast-in-place concrete and grout.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. American Concrete Institute (ACI):
    - a. 117, Specification for Tolerances for Concrete Construction and Materials.
    - b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
    - c. 212.3R, Chemical Admixtures for Concrete.
    - d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
    - e. 304.2R, Placing Concrete by Pumping Methods.
    - f. 305.1, Hot Weather Concreting.
    - g. 306.1, Cold Weather Concreting.
    - h. 318, Building Code Requirements for Structural Concrete.
    - i. 347, Guide to Formwork for Concrete.
    - j. CT-13, Concrete Terminology.
  2. ASTM International (ASTM):
    - a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
    - b. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
    - c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    - d. A1064, Standard Specification for Steel Wire and Welded Wire Replacement, Plain and Deformed, for Concrete.
    - e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
    - f. C33, Standard Specification for Concrete Aggregates.
    - g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    - h. C94/C94M, Standard Specification for Ready-Mixed Concrete.
    - i. C138, Standard Method of Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
    - j. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
    - k. C150, Standard Specification for Portland Cement.
    - l. C172, Standard Practice for Sampling Freshly Mixed Concrete.
    - m. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
    - n. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
    - o. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
    - p. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - q. C494, Standard Specification for Chemical Admixtures for Concrete.
    - r. C1293, Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
    - s. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
    - t. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheet.

- u. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
  - v. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
  - w. D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
  - x. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - y. E96, Standard Test Methods for Water Vapor Transmission of Materials.
  - z. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
- 3. National Ready Mixed Concrete Association (NRMCA).
  - 4. National Sanitation Foundation (NSF):
    - a. 61, Drinking Water System Components - Health Effects.
- B. Quality Control:
- 1. Concrete testing agency:
    - a. Contractor to employ and pay for services of a testing laboratory to:
      - 1) Perform materials evaluation.
      - 2) Design concrete mixes.
    - b. Concrete testing agency to meet requirements of ASTM E329.
  - 2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
    - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
  - 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
    - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
- C. Qualifications:
- 1. Ready mixed concrete batch plant certified by NRMCA.

### 1.3 DEFINITIONS

- A. Per ACI CT-13 except as modified herein:
- 1. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
  - 2. Exposed concrete: Exposed to view after construction is complete.
  - 3. Required: Required by Contract Documents.
  - 4. Specified strength: Specified compressive strength at 28 days.
  - 5. Submitted: Submitted to Engineer.

### 1.4 SUBMITTALS

- A. Shop Drawings:
- 1. See special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Concrete mix designs proposed for use.
    - a. Concrete mix design submittal to include the following information:
      - 1) Sieve analysis and source of fine and coarse aggregates.
      - 2) Test for aggregate organic impurities.
      - 3) Test for deleterious aggregate per ASTM C1293.
      - 4) Proportioning of all materials.
      - 5) Type of cement with mill certificate for cement.
      - 6) Slump.
      - 7) Air content.
      - 8) Brand, type, ASTM designation, and quantity of each admixture proposed for use.
      - 9) 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.



3. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Manufacturer's installation instructions.
  - c. Manufacturers and types:
    - 1) Joint fillers.
    - 2) Curing agents.
    - 3) Chemical sealer.
    - 4) Bonding and patching mortar.
    - 5) Construction joint bonding adhesive.
    - 6) Nonshrink grout with cure/seal compound.
4. Reinforcing steel:
  - a. Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
  - b. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
  - c. Obtain approval of Shop Drawings by Engineer before fabrication.
  - d. Mill certificates.
5. Scaled (minimum 1/8 IN per foot) drawings showing proposed locations of construction joints, control joints, expansion joints (as applicable) and joint dimensions.
6. Strength test results of in place concrete including slump, air content and concrete temperature.
7. Certifications:
  - a. Certification of standard deviation value in psi for ready mix plant supplying the concrete.
  - b. Certification that the material and sources submitted in the mix design will be used in the concrete for this project.
8. Test reports:
  - a. Cement mill reports for all cement to be supplied.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage of Material:
  1. Cement and pozzolan:
    - a. Store in moistureproof, weathertight enclosures.
    - b. Do not use if caked or lumpy.
  2. Aggregate:
    - a. Store to prevent segregation and contamination with other sizes or foreign materials.
    - b. Obtain samples for testing from aggregates at point of batching.
    - c. Do not use frozen or partially frozen aggregates.
    - d. Do not use bottom 6 IN of stockpiles in contact with ground.
    - e. Allow sand to drain until moisture content is uniform prior to use.
  3. Admixtures:
    - a. Protect from contamination, evaporation, freezing, or damage.
    - b. Maintain within temperature range recommended by manufacturer.
    - c. Completely mix solutions and suspensions prior to use.
  4. Reinforcing steel: Support and store all rebars above ground.
- B. Delivery:
  1. Concrete:
    - a. Prepare a delivery ticket for each load for ready-mixed concrete.
    - b. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
    - c. Ticket to show:
      - 1) Mix identification mark.
      - 2) Quantity delivered.
      - 3) Amount of each material in batch.
      - 4) Outdoor temp in the shade.
      - 5) Time at which cement was added.

- 6) Numerical sequence of the delivery.
- 7) Amount of water added.
2. Reinforcing steel:
  - a. Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
  - b. Mark numbers to match Shop Drawing mark number.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:
  1. Nonshrink, nonmetallic grout:
    - a. Sika "SikaGrout 212."
    - b. Euclid Chemical "NS Grout."
    - c. BASF Admixtures, Inc. "Masterflow 713."
  2. Expansion joint fillers:
    - a. Permaglaze Co.
    - b. Rubatex Corp.
    - c. Williams Products, Inc.
  3. Form coating:
    - a. Richmond "Rich Cote."
    - b. Industrial Lubricants "Nox-Crete Form Coating."
    - c. Euclid Chemical "Kurez DR VOX."
  4. Hydrophillic waterstop
    - a. SIKA Hydrotite
    - a. Or approved equal.
- B. Submit request for substitution in accordance with General Provisions Article 5.

### **2.2 MATERIALS**

- A. All concrete mix materials, additives and coating, and grouting shall be NSF-61 approved. All concrete components that have a point of contact with water shall be NSF-61 approved.
- B. Cement:
  1. ASTM C150, Type V.
  2. Cement type used shall correspond to that upon which selection of concrete proportions was based in the mix design.
- C. Admixtures:
  1. Air entraining: ASTM C260.
  2. Water reducing, retarding, and accelerating: Conform to ASTM C494, Types A through E, and provisions of ACI 212.3R.
  3. High range water reducers (superplasticizers): Conform to ASTM C494, Types F or G.
  4. All concrete mixes require the use of water reducers to maintain the specified water-to-cement ratios without additional cement.
  5. SCM: Per above.
  6. Admixtures to be chloride free.
    - a. Do not use calcium chloride.
  7. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.
  8. Provide admixtures certified by manufacturer to be compatible with other admixtures.
  9. Shrinkage reducing admixtures:
    - a. Admixture used to reduce the shrinkage of Portland Cement concrete.
    - b. Utilize at dosage necessary to help achieve required shrinkage value stated herein.
    - c. Similar to:
      - 1) Eclipse 4500 by GCP Applied Technologies, Inc.

- 2) Conex by Euclid Chemical Co.
  - 3) MasterLife SRA 20 or MasterLife CRA 007 by BASF Corporation.
- D. Water: Potable, clean, free of oils, acids and organic matter.
- E. Aggregates:
1. Normal weight concrete: ASTM C33, except as modified below.
  2. Fine aggregate:
    - a. Clean natural sand.
    - b. No manufactured or artificial sand.
  3. Coarse aggregate:
    - a. Crushed rock, natural gravel, or other inert granular material.
    - b. Maximum amount of clay or shale particles: 1 PCT.
  4. Gradation of coarse aggregate:
    - a. All concrete: Size #57 or #67.
- F. Concrete Grout:
1. Nonshrink, nonmetallic grout:
    - a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
    - b. Grout to produce a positive but controlled expansion.
    - c. Mass expansion not to be created by gas liberation.
    - d. Minimum compressive strength of nonshrink grout at 28 days: 6500 PSI.
    - e. In accordance with COE CRD-C621.
  2. Epoxy grout:
    - a. 3-component epoxy resin system.
      - 1) Two liquid epoxy components.
      - 2) One inert aggregate filler component.
    - b. Each component packaged separately for mixing at jobsite.
- G. Reinforcing Steel:
1. Reinforcing bars: ASTM A615, Grade 60.
  2. Welded wire reinforcement:
    - a. ASTM A185 or ASTM A1064.
    - b. Minimum yield strength: 60,000 PSI.
- H. Forms:
1. Prefabricated or job built.
  2. Wood forms:
    - a. 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
    - b. Built-in-place or prefabricated type panel.
  3. Metal forms:
    - a. Metal forms may be used except for aluminum in contact with concrete.
    - b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
  4. Chamfer strips: Clear white pine, surface against concrete planed.
- I. Form Ties:
1. Commercially fabricated for use in form construction.
    - a. Field fabricated ties are unacceptable.
  2. Constructed so that ends or end fasteners can be removed without causing spalling at surfaces of the concrete.
  3. 3/4 IN minimum to 1 IN maximum diameter cones on both ends.
  4. Embedded portion of ties to be not less than 1-1/2 IN from face of concrete after ends have been removed.
  5. Cone size:
    - a. 3/4 IN minimum diameter cones on both ends.
    - b. Depth of cone not to exceed the concrete reinforcing cover.
  6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

- J. Chemical Floor Sealer:
  - 1. Colorless low VOC water-based solution containing acrylic copolymers.
    - a. ASTM C1315, Class B, minimum 30 PCT solids.
  - 2. L&M Construction Chemicals Inc. Dress & Seal WB 30.
- K. Membrane Curing Compound:
  - 1. ASTM C309, Type 1D, Class A or B.
  - 2. Fugitive dye shall dissipate over time and exposure.
  - 3. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
- L. Expansion Joint Filler:
  - 1. In contact with water:
    - a. Closed cell neoprene.
    - b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 PSI compression deflection (Grade SCE41).

## 2.3 CONCRETE MIXES

- A. General:
  - 1. All concrete to be ready mixed concrete conforming to ASTM C94/C94M.
  - 2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
  - 3. All concrete to be normal weight concrete.
  - 4. Provide pozzolan content for all cast-in-place construction.
- B. Strength:
  - 1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
All general use concrete	Normal weight	4000 PSI

\* Minimum 28-day compressive strength.

- C. Air Entrainment:
  - 1. Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	6 ±1-1/2
<3/4 IN	6-1/2 ±1-1/2

- 2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.
- D. Slump - 4 IN maximum, 1 IN minimum:
  - 1. Measured at point of discharge of the concrete into the concrete construction member.
  - 2. 8 IN maximum after addition of superplasticizer (if used).
  - 3. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
  - 4. Pumped concrete:
    - a. Provide additional water at batch plant to allow for slump loss due to pumping.
    - b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified and the maximum specified water-cement ratio is not exceeded.
  - 5. Slump may be adjusted in the field through the use of water reducers.
    - a. Coordinate dosage and mixing requirements with concrete supplier.
  - 6. Determine slump per ASTM C143.

E. Selection of Proportions:

1. General:
  - a. Proportion ingredients to:
    - 1) Produce proper workability, durability, strength, and other required properties.
    - 2) Prevent segregation and collection of excessive free water on surface.
2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	MINIMUM CEMENT, MAXIMUM AGGREGATE SIZE			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	1/2 IN	3/4 IN	1 IN	
4000	564	564	564	0.45

3. Concrete mix proportioning methods for normal weight concrete:
  - a. Proportion mixture to provide desired characteristics using one of methods described below:
    - 1) Method 1 (Trial Mix):
      - a) Per ACI 318, Chapter 5, except as modified herein.
      - b) Air content within range specified above.
      - c) Record and report temperature of trial mixes.
      - d) Proportion trial mixes per ACI 211.1.
    - 2) Method 2 (Field Experience):
      - a) Per ACI 318, Chapter 5, except as modified herein:
      - b) Field test records must be acceptable to Engineer to use this method.
      - c) Test records shall represent materials, proportions and conditions similar to those specified.
4. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Chapter 5 of ACI 318 using the standard deviation of the proposed concrete production facility.

## PART 3 - EXECUTION

### 3.1 FORMING AND PLACING CONCRETE

A. Formwork:

1. Contractor is responsible for design and erection of formwork.
2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
  - a. Allowable tolerances: As recommended in ACI 347.
3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.
  - a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
  - b. Do not place floor drains through beams.
4. Openings:
  - a. Provide openings in formwork to accommodate work of other trades.
  - b. Accurately place and securely support items built into forms.
5. Chamfer strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
6. Clean and adjust forms prior to concrete placement.
7. Tighten forms to prevent mortar leakage.
8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

B. Reinforcement:

1. Position, support and secure reinforcement against displacement.
2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.

3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
  4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
  5. Extend reinforcement to within 2 IN of concrete perimeter edges.
    - a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
  6. Minimum concrete protective covering for reinforcement: As shown on Drawings.
  7. Do not weld reinforcing bars.
- C. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
  2. See Specification Section 03 15 19 - Anchorage to Concrete.
  3. Use setting diagrams, templates and instructions for locating and setting.
- D. Placing Concrete:
1. Place concrete in compliance with ACI 304R and ACI 304.2R.
  2. Place in a continuous operation within planned joints or sections.
  3. Begin placement when work of other trades affecting concrete is completed.
  4. Place concrete by methods which prevent aggregate segregation.
  5. Do not allow concrete to free fall more than 4 FT.
  6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.
- E. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.
- F. Protection:
1. Protect concrete from physical damage or reduced strength due to weather extremes.
  2. In cold weather comply with ACI 306.1 except as modified herein.
    - a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
    - b. Do not place heated concrete that is warmer than 80 DEGF.
    - c. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DEGF for 7 days or 70 DEGF for 3 days.
    - d. Do not allow concrete to cool suddenly.
  3. In hot weather comply with ACI 305.1 except as modified herein.
    - a. At air temperature of 90 DEGF and above, keep concrete as cool as possible during placement and curing.
    - b. Do not allow concrete temperature to exceed 90 DEGF at placement.
    - c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
    - d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305.1, Figure 2.1.5.
- G. Curing:
1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
  2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
  3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
  4. Provide curing for minimum of 7 days.
  5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
  6. In hot weather follow curing procedures outlined in ACI 305.1.
  7. In cold weather follow curing procedures outlined in ACI 306.1.
  8. Curing vertical surfaces with a curing compound:
    - a. Cover vertical surfaces with a minimum of two coats of the curing compound.

- b. Allow the preceding coat to completely dry prior to applying the next coat.
- c. Apply the first coat of curing compound immediately after form removal.
- d. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
- e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

H. Form Removal:

- 1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.

### 3.2 CONCRETE FINISHES

A. Tolerances:

- 1. 1/8 IN in 10 FT.

B. All surfaces:

- 1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
  - a. To be covered with a coating or covering material applied directly to concrete.
  - b. Scheduled for grout cleaned finish.
- 2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.

C. Troweled Finish:

- 1. Float finish surface.
- 2. Next power trowel, and finally hand trowel.
- 3. Do not use water to aid in finishing.
- 4. Produce a smooth surface which is relatively free of defects with first hand troweling.
- 5. Perform additional trowelings by hand after surface has hardened sufficiently.
- 6. Final trowel when a ringing sound is produced as trowel is moved over surface.
- 7. Thoroughly consolidate surface by hand troweling.
- 8. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
- 9. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.

### 3.3 GROUT

A. Preparation:

- 1. Nonshrinking, nonmetallic grout:
  - a. Clean concrete surface to receive grout.
  - b. Saturate concrete with water for 24 HRS prior to grouting.

B. Application:

- 1. Nonshrinking, nonmetallic grout:
  - a. Mix in a mechanical mixer.
  - b. Use no more water than necessary to produce flowable grout.
  - c. Place in accordance with manufacturer's instructions.
  - d. Completely fill all spaces and cavities below the bottom of baseplates.
  - e. Provide forms where baseplates and bedplates do not confine grout.
  - f. Where exposed to view, finish grout edges smooth.
  - g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
  - h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
  - i. Wet cure grout for seven days, minimum.

### 3.4 FIELD QUALITY CONTROL

A. Owner will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.

- 1. Contractor to cooperate with Owner in obtaining and testing samples.

B. Tests During Construction:

1. Strength test:

- a. For each strength test, mold and cure cylinders from each sample in accordance with ASTM C31.
  - 1) Cylinder size: Per ASTM C31.
    - a) 4 IN cylinders may not be used for concrete mixes with concrete aggregate size larger than 1 IN.
  - 2) Quantity:
    - a) 6 IN DIA by 12 IN high: Four cylinders.
- b. Field cure one (1) cylinder for the seven day test.
  - 1) Laboratory cure the remaining.
- c. Test cylinders in accordance with ASTM C39.
  - 1) 6 IN DIA cylinders:
    - a) Test two cylinders at 28 days for strength test result and the one field cured sample at seven days for information.
    - b) Hold remaining cylinder in reserve.
- d. Strength test result:
  - 1) Average of strengths of two 6 IN DIA cylinders from the same sample tested at 28 days.
  - 2) If one cylinder in a test manifests evidence of improper sampling, molding, handling, curing, or testing, discard and test reserve cylinder(s); average strength of remaining cylinders shall be considered strength test result.
  - 3) Should all cylinders in any test show any of above defects, discard entire test.
- e. Frequency of tests:
  - 1) All concrete:
    - a) One strength test to be taken not less than once a day, nor less than once for each 60 CUYD or fraction thereof placed in any one day.
    - b) Once for each 5000 SQFT of slab or wall surface area placed each day.
    - c) If total volume of concrete on Project is such that frequency of testing required in above paragraph will provide less than five strength tests for each concrete mix, tests shall then be made from at least five randomly selected batches or from each batch if fewer than five batches are provided.

2. Slump test:

- a. Per ASTM C143.
  - b. Determined for each strength test sample.
  - c. Additional slump tests may be taken.
3. Air content:
- a. Per ASTM C231, ASTM C173, and ASTM C138.
  - b. Determined for each strength test sample.
4. Temperature: Determined for each strength test sample.

C. Evaluation of Tests:

1. Strength test results:

- a. Average of 28-day strength of two cylinders from each sample.
  - 1) If one cylinder manifests evidence of improper sampling, molding, handling, curing or testing, strength of remaining cylinder will be test result.
  - 2) If both cylinders show any of above defects, test will be discarded.

D. Acceptance of Concrete:

1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
  - a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
  - b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 PSI.
2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.



- a. Perform additional tests and/or corrective measures at no additional cost to Owner.
- E. Concrete tolerances per ACI 117.

### **3.5 SCHEDULES**

- A. Form Types:
  - 1. All surfaces:
    - a. Prefabricated or job-built wood forms.
    - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
    - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
    - d. Construct forms sufficiently tight to prevent leakage of mortar.
- B. Grout:
  - 1. Nonshrinking, nonmetallic grout: General use.
- C. Concrete:
  - 1. General use concrete: All locations.
- D. Concrete Finishes:
  - 1. Slab finishes:
    - a. Use following finishes as applicable, unless otherwise indicated:
      - 1) Troweled finish: Interior floor slabs and equipment bases.

### **END OF SECTION**



**SECTION 03 15 19**  
**ANCHORAGE TO CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for all reinforcing adhesive anchorage and post-installed concrete anchors required for the Project but not specified elsewhere in the Contract Documents.
  - 2. Design of all concrete anchors not indicated on the Drawings including, but not limited to, installation of anchors into concrete for the following structural and nonstructural components:
    - a. Structural members and accessories.
    - b. Metal, and plastic fabrications.
    - c. Mechanical and electrical equipment and components.
    - d. Piping work.
    - e. All other components requiring attachment to concrete.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Concrete Institute (ACI):
    - a. 318, Building Code Requirements for Structural Concrete and Commentary.
  - 2. American Concrete Institute/Concrete Reinforcing Steel Institute (ACI-CRSI):
    - a. Adhesive Anchor Installation Certification Program: Adhesive Anchor Installer.
  - 3. American Institute of Steel Construction (AISC):
    - a. 303, Code of Standard Practice for Steel Buildings and Bridges.
  - 4. ASTM International (ASTM):
    - a. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
    - b. F594, Standard Specification for Stainless Steel Nuts.
    - c. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
  - 5. ICC Evaluation Service (ICC-ES):
    - a. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
    - b. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
  - 6. Building code:
    - a. California Building Code and associated standards, 2016 Edition including all City of Folsom amendments, referred to herein as Building Code.
- B. Qualifications:
  - 1. Anchor designer for Contractor-designed post-installed anchors shall be a professional civil engineer licensed in the State of California.
  - 2. Installer for post-installed anchors shall be trained by the manufacturer or certified by a training program approved by the Engineer.
- C. Post-installed anchors and related materials shall be listed by the following agencies:
  - 1. ICC-ES.
  - 2. Engineer approved equivalent.

**1.3 DEFINITIONS**

- A. Adhesive Anchors:
  - 1. Post-installed anchors developing their strength primarily from chemical bond between the concrete and the anchor.
  - 2. Includes anchors using acrylics, epoxy and other similar adhesives.

- B. Anchor Bolt: Any cast-in-place anchorage that is made of a headed (i.e. bolt) material.
- C. Anchor Rod: Any cast-in-place or post-installed anchorage made from unheaded, threaded, rod or deformed bar material.
- D. Concrete Anchor: Generic term for either an anchor bolt or an anchor rod.
- E. Installer or Applicator:
  - 1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
  - 2. Installer and applicator are synonymous.
- F. MPII: Manufacturer's printed installation instructions.
- G. Mechanical Anchors:
  - 1. Post-installed anchors developing their strength from attachment other than thru adhesives or chemical bond to concrete.
  - 2. Includes expansion anchors, expansion sleeve, screw anchors, undercut anchors, specialty inserts and other similar types of anchorages.
  - 3. Drop-in anchors and other similar anchors are not allowed.
- H. Post-Installed Anchor: Any adhesive or mechanical anchor installed into previously placed and adequately cured concrete.

#### 1.4 SUBMITTALS

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data including:
    - a. Acknowledgement that submitted products meet requirements of referenced standards.
    - b. Manufacturer material data sheet for each anchor.
      - 1) Clearly indicate which products on the data sheet are proposed for use on the Project.
    - c. Manufacturer's printed installation instructions.
    - d. Current ICC-ES report for each post-installed anchor system indicating the following:
      - 1) Certification that anchors meet all requirements indicated in this Specification.
      - 2) Performance data showing that anchor is approved for use in cracked concrete.
      - 3) Seismic design categories for which anchor system has been approved.
      - 4) Required installation procedures.
      - 5) Special inspection requirements for installation.
    - e. Anchorage layout drawings and details:
      - 1) Indicate anchor diameter, embedment, length, anchor type, material and finish.
      - 2) Drawings showing location, configuration, spacing and edge distance.
    - f. Contractor Designed Post-Installed Anchors:
      - 1) Show diameter and embedment depth of each anchor.
      - 2) Indicate compliance with ACI 318, Appendix D.
      - 3) Design tension and shear loads used for anchor design.
      - 4) Engineering design calculations:
        - a) Indicate design load to each anchor.
        - b) When the design load is not indicated on Drawings, include calculations to develop anchor forces based on Design Criteria listed herein.
        - c) Sealed and signed by contractor's professional engineer.
        - d) Calculations will be submitted for information purposes only.
      - 5) Type of post-installed anchor system used.
        - a) Provide manufacturer's ICC-ES report for the following:
          - (1) Mechanical anchorage per ICC-ES AC193.
          - (2) Adhesive anchorage per ICC-ES AC308.

- B. Samples:
  - 1. Representative samples of concrete anchors may be requested by Engineer. Review will be for type and finish only. Compliance with all other requirements is exclusively the responsibility of the Contractor.
- C. Informational Submittals:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Certification of qualifications for each installer of post-installed anchors.
    - a. Indicate successful completion or certification for each type of approved post-installed anchor as required by the Contract Documents.
    - b. Provide one of the following for each type of anchor, as required by this specification section:
      - 1) Letter from manufacturer documenting successful training completion.
      - 2) Certification of completion for Engineer approved program.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to job site in manufacturer's or distributor's packaging undamaged and complete with installation instructions.
- B. Store above ground on skids or other supports to keep items free of dirt and other foreign debris and to protect against corrosion.
- C. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Post-Installed Mechanical and Adhesive Concrete Anchors:
  - 1. Stainless steel with matching nut and washer.
  - 2. ASTM F593, Type 316.
- B. Reinforcement: See Section 03 09 00.
- C. Washers:
  - 1. ASTM F436 unless noted otherwise.
  - 2. If stainless steel anchorage is being used for cast-in-place anchorage, furnish washers of the same material and alloy as in the accompanying anchorage.
  - 3. Plate washers: Minimum 1/2 IN thick fabricated ASTM A36 square plates as required.
  - 4. Follow manufacturer's requirements for all post-installed anchorage.
- D. Nuts:
  - 1. ASTM A563 for all cast-in-place anchorage.
  - 2. If stainless steel anchorage is being used for cast-in-place anchorage, nuts shall meet ASTM F594 and be the matching material and alloy as in the accompanying anchorage.
  - 3. Follow manufacturer's requirements if using post-installed anchorage.
- E. Dissimilar Materials Protection: See Specification Section 09 96 00.

### **2.2 CONTRACTOR DESIGNED ANCHORAGE**

- A. Acceptable Manufacturers:
  - 1. Post-installed anchor systems for the listed manufacturers will be considered only if a current ICC-ES evaluation report is submitted in accordance with the SUBMITTALS Article in PART 1 of this Specification Section and if the anchor system is approved by the Engineer.
    - a. Hilti.

- b. Dewalt.
  - c. Simpson Strong-Tie.
- 2. Submit request for substitution in accordance with General Provisions Article 5.
- B. Design the anchorage when any of the following occur:
  - 1. Design load for concrete anchorage is shown on the Drawings.
  - 2. When specifically required by the Contract Documents.
  - 3. When an anchorage is required but not specified in the Drawings.
  - 4. When anchorage is shown on Drawings other than Structural Drawings.
- C. Anchorage Design Loads:
  - 1. Determine all of the design loads, including wind and seismic loads, per the Building Code.
    - a. Anchorage of equipment and non-structural components: Use the actual dead and operating loads provided by the manufacturer.
- D. When Contract Drawings, other than the Structural Drawings, indicate an anchor diameter or length, the Contractor design shall incorporate these as "minimums."
- E. Post-installed Concrete Anchors:
  - 1. Provide the manufacturer's system name/type, nominal diameter, embedment depth, spacing, minimum edge distance, cover, and design capacity to resist the specified or calculated load based on requirements given in the Building Code, ACI 318, Appendix D, and current ICC-ES report, for the anchor to be used.
  - 2. Design assuming cracked concrete.

## **2.3 ENGINEER DESIGNED ANCHORAGE**

- A. When the size, length and details of anchorages are shown on Contract Structural Drawings, Contractor design of anchorage is not required unless otherwise indicated.
- B. Acceptable Manufacturers:
  - 1. Additional newer post-installed anchor systems for the listed manufacturers will be considered only if a current evaluation agency report is submitted in accordance with the SUBMITTALS Article in PART 1 of this Specification Section, the anchor system is certified by ICC-ES for cracked concrete conditions, and if approved by the Engineer.
  - 2. Mechanical Anchors:
    - a. Hilti:
      - 1) Kwik Bolt TZ (ICC-ES ESR-1917).
  - 3. Adhesive Concrete Anchors:
    - a. Hilti:
      - 1) HIT RE 500 V3 (ICC ESR-3814).
  - 4. Submit request for substitution in accordance with General Provisions Article 5.
    - a. Substitution request to indicate the proposed anchor has the at least the same tension and shear strength as the specified anchor installed as indicated in the Contract Drawings.
    - b. Calculations to be stamped by a Professional Engineer registered in the state that the Project is located in.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Adhesive Anchorage:
  - 1. Use only where specifically indicated on the Drawings or when approved for use by the Engineer.
  - 2. May be used where subjected to vibration or where buried or submerged.
  - 3. Do not use in overhead applications or sustained tension loading conditions such as utility hangers.

4. Contact Engineer for clarification when anchors will not be installed in compliance with manufacturer's printed installation requirements.
- B. Mechanical Anchorage:
  1. Use only where specifically indicated on the Drawings or when approved for use by the Engineer.
  2. Do not use where subjected to vibration.
  3. May be used in overhead applications.
  4. Contact Engineer for clarification when anchors will not be installed in compliance with manufacturer's printed installation requirements.
- C. Do not use powder actuated fasteners and other types of bolts and fasteners not specified herein for structural applications unless approved by the Engineer or specified in Contract Documents.

### 3.2 PREPARATION

- A. Provide adequate time to allow for proper installation and inspection prior to placing concrete for cast-in-place concrete anchorage.
- B. Prior to installation, inspect and verify areas and conditions under which concrete anchorage is to be installed.
  1. Notify Engineer of conditions detrimental to proper and timely completion of work.
  2. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.
- C. Special Inspection is required in accordance with the Building Code for all concrete anchorage.
  1. Notify the Special Inspector that an inspection is required prior to concrete placement (or during post-installed anchorage installation).
  2. See the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section for additional requirements.
- D. Post-installed anchor manufacturer's representative shall demonstrate and observe the proper installation procedures for the post-installed anchors at no additional expense to the Owner.
  1. Follow such procedures to assure acceptable installation.
  2. Adhesive anchors must be installed in concrete aged a minimum of 21 days

### 3.3 INSTALLATION

- A. Tie cast-in-place anchorage in position to embedded reinforcing steel using wire.
  1. Tack welding of anchorage is prohibited.
  2. Anchorage location tolerance shall be in accordance with AISC 303.
  3. Provide steel or durable wood templates for all column and equipment anchorage.
    - a. Templates to be placed above top of concrete and not impede proper concrete placement and consolidation.
- B. Unless noted or specified otherwise:
  1. Provide washers for all anchorage.
  2. Where exposed, extend threaded anchorage a maximum of 3/4 IN and a minimum of 1/2 IN above the top of the fully engaged nut.
    - a. If anchorage is cut off to the required maximum height, threads must be dressed to allow nuts to be removed without damage to the nuts.
- C. Do the following after nuts are snug-tightened down:
  1. If using post-installed anchorage, follow manufacturer's installation procedures.
- D. Assure that embedded items are protected from damage and are not filled in with concrete.
- E. Coat aluminum surfaces in contact with dissimilar materials in accordance with Specification Section 09 96 00.
- F. For post-installed anchors, comply with the MPII on the hole diameter and depth required to fully develop the tensile strength of the anchor or reinforcing bar.

1. Use hammer drills to create holes.
2. Properly clean out the hole per the ICC-ES reports utilizing a non-metallic fiber bristle brush and compressed air or as otherwise required to remove all loose material from the hole prior to installing the anchor in the presence of the Special Inspector.

#### **3.4 CLEANING**

- A. After concrete has been placed, remove protection and clean all anchorage of all concrete, dirt, and other foreign matter.
- B. Provide surface acceptable to receive field applied paint coatings when specified in Specification Section 09 96 00.

**END OF SECTION**



**SECTION 05 50 00**  
**METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Custom fabricated metal items and certain manufactured units not otherwise indicated to be supplied under work of other Specification Sections.
  2. Design of all temporary bracing not indicated on Drawings.
  3. Design of systems and components, including but not limited to:
    - a. Ladders.
    - b. Modular framing system.
    - c. Aluminum guardrail gates.
    - d. Aluminum guardrail.
    - e. Structural supports for elevated walkway platform on top of Decant pump station wet well.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. Aluminum Association (AA):
    - a. ADM 1, Aluminum Design Manual.
  2. The American Ladder Institute (ALI):
    - a. A14.3, Ladders - Fixed - Safety Requirements.
  3. American Society of Civil Engineers (ASCE):
    - a. 7, Minimum Design Loads for Buildings and Other Structures.
  4. ASTM International (ASTM):
    - a. A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
    - b. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
    - c. F879, Standard Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws.
    - d. F1789, Standard Terminology for F16 Mechanical Fasteners.
    - e. F3125, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
  5. American Welding Society (AWS):
    - a. D1.2, Structural Welding Code - Aluminum.
  6. National Association of Architectural Metal Manufacturers (NAAMM):
    - a. AMP 510, Metal Stairs Manual.
    - b. MBG 531, Metal Bar Grating Manual.
  7. NACE International (NACE).
  8. Occupational Safety and Health Administration (OSHA):
    - a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.
  9. Building code:
    - a. California Building Code and associated standards, 20016 Edition including all City of Folsom amendments, referred to herein as Building Code.
- B. Qualifications:
1. Qualify welding procedures and welding operators in accordance with AWS.
  2. Fabricator shall have minimum of 10 years experience in fabrication of metal items specified.

3. Engineer for contractor-designed systems and components: Professional structural engineer licensed in the State of California.

### **1.3 DEFINITIONS**

- A. Fasteners: As defined in ASTM F1789.
- B. Hardware: As defined in ASTM A153/A153M.
- C. Installer or Applicator:
  1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
  2. Installer and applicator are synonymous.
- D. Guardrail or Handrail: A system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level. All intents and purposes the term guardrail and handrail are interchangeable on this project.

### **1.4 SUBMITTALS**

- A. Shop Drawings:
  1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  2. Fabrication and/or layout drawings and details:
    - a. Submit drawings for all fabrications and assemblies.
      - 1) Include erection drawings, plans, sections, details and connection details.
    - b. Identify materials of construction, shop coatings and third party accessories.
  3. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
    - c. Provide manufacturer's standard allowable load tables for the following:
      - 1) Grating.
      - 2) Castings and accessories.
      - 3) Modular framing systems.
  4. Contractor designed systems and components:
    - a. Certification that manufactured units meet all design loads specified.
    - b. Shop Drawings and engineering design calculations:
      - 1) Indicate design live loads.
      - 2) Sealed by a licensed professional engineer, registered in the State of California.
      - 3) Engineer will review for general compliance with Contract Documents.
    - c. Contractor designed systems and components include the following:
      - 1) Ladders.
      - 2) Grating.
      - 3) Guardrail.
      - 4) Guardrail gate.
      - 5) Structural supports for elevated walkway platform on top of Decant pump station wet well.
- B. Informational Submittals:
  1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  2. Certification of welders and welding processes.
    - a. Indicate compliance with AWS.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and handle fabrications to avoid damage.
- B. Store above ground on skids or other supports to keep items free of dirt and other foreign debris and to protect against corrosion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Mechanical anchor bolts:
    - a. See Section 03 15 19.
  - 2. Epoxy adhesive anchor bolts:
    - a. See Section 03 15 19.
  - 3. Aluminum ladders:
    - a. Any manufacturer capable of meeting the requirements of this Specification Section.
  - 4. Modular framing system:
    - a. Unistrut Building Systems.
    - b. B-Line Systems.
    - c. Kindorf.
  - 5. Mechanically fastened railing system (for guardrail):
    - a. Peak to Peak Engineered Railings
    - b. Golden Railing Inc.
- B. Submit request for substitution in accordance with General Provisions Article 5.

### **2.2 MATERIALS**

- A. Stainless Steel:
  - 1. Stainless steel in welded applications: Low carbon 'L' type.
  - 2. Minimum yield strength of 30,000 PSI and minimum tensile strength of 75,000 PSI.
    - a. Bolts and nuts: ASTM F593, Type 304 or 316.
    - b. Bars, shapes: ASTM A276, Type 304.
    - c. Tubing and pipe: ASTM A269, ASTM A312 or ASTM A554, Type 304.
    - d. Strip, plate and flat bars: ASTM A666, Type 304.
  - 3. Minimum yield strength of 25,000 PSI and minimum tensile strength of 70,000 PSI.
    - a. Strip, plate and flat bar for welded connections, ASTM A666, Type 304L.
  - 4. Welding electrodes: In accordance with AWS for metal alloy being welded.
- B. Aluminum:
  - 1. Alloy 6061-T6, 32,000 PSI tensile yield strength minimum.
    - a. ASTM B221 and ASTM B308 for shapes including beams, channels, angles, tees and zees.
  - 2. Alloy 6063-T5 or T6, 15,000 PSI tensile yield strength minimum.
    - a. ASTM B221 and ASTM B429 for bars, rods, wires, pipes and tubes.
  - 3. ASTM B26 for castings.
  - 4. ASTM F468, alloy 2024 T4 for bolts.
  - 5. ASTM F467, alloy 2024 T4 for nuts.
  - 6. Electrodes for welding aluminum: AWS D1.2, filler alloy 4043 or 5356.
- C. Washers: Same material and alloy as found in accompanying bolts and nuts.
- D. Embedded Anchor Bolts:
  - 1. See Specification Section 03 15 19.
- E. Mechanical Anchor Bolts and Adhesive Anchor Bolts:
  - 1. See Specification Section 03 15 19.
- F. Dissimilar Materials Protection: See Specification Section 09 96 00.

### **2.3 MANUFACTURED UNITS**

- A. Ladders:
  - 1. General:
    - a. Fully welded type.

- 1) All welds to be full penetration welds, unless otherwise specified.
- b. All ladders of a particular material shall have consistent construction and material shapes and sizes unless noted otherwise on the Drawings.
- c. Design ladder in accordance with California OSHA Standards, ANSI A14.3, ASCE 7 and applicable Building Codes.
- d. Ladders shall be designed to support a minimum concentrated live load of 300 LBS at any point to produce the maximum stress in the member being designed.
  - 1) Apply additional 300 LB loads for each section of ladder exceeding 10 FT.
- e. Maximum allowable stresses per AA ADM 1.
- f. Maximum lateral deflection: Side rail span/240 when lateral load of 100 LBS is applied at any location.
2. Material:
  - a. Aluminum.
  - b. Finish:
    - 1) Mill.
3. Rails:
  - a. Flat bars:
    - 1) 1/2 IN x 4 IN minimum.
    - 2) Aluminum
  - b. Spacing:
    - 1) Minimum clear distance between rails to be 18 IN.
  - c. Provide cap at exposed top and bottom of side rails.
    - 1) Provide weep holes as necessary to prevent the accumulation of moisture within hollow members.
  - d. Extend side rails of step-through ladders a minimum of 42 IN above the landing.
4. Rungs:
  - a. As shown drawings.
    - 1) Integral non-slip finish on all sides.
      - a) Non-slip finish: Coarse knurling or extruded serrations.
      - b) Shop or field-applied grit tape and cap type non-slip finishes are not acceptable.
  - b. Rungs shall penetrate inside wall of side rails.
    - 1) Do not extend rungs beyond the outside face of the side rail.
    - 2) Provide fillet weld all around rung at inside face of side rail and plug weld at outside face of side rail.
  - c. Rung spacing:
    - 1) Uniform, 12 IN.
    - 2) Top rung shall be level with landing or platform.
      - a) Where top of ladder terminates at grating cover, floor access, or similar condition; locate top rung as close as practicable to, but not more than 6 IN below, adjacent walking surface.
    - 3) Spacing of bottom rung from grade or platform may vary but shall not exceed 14 IN.
5. Brackets:
  - a. Angle or bent plate brackets welded to side rails:
    - 1) Minimum distance from centerline of rung to wall or any obstruction: 7 IN.
    - 2) Maximum spacing: 6 FT OC.
  - b. For floor supported ladders, provide 3/8 by 2-1/2 by 4 IN rectangular bracket or 3/8 by 6 by 6 IN square plate welded to rails with punched holes for 3/4 IN bolts.
    - 1) Provide wall brackets on floor supported units if vertical run is over 4 FT.
  - c. Constructed of same material and sizes as the railing system.
- B. Aluminum Grating:
  1. NAAMM MBG 531.
  2. Minimum depth: 1-1/2 IN.
  3. Minimum rectangular bearing bar size:

- a. 3/16 IN thick.
    - b. Maximum 1-3/16 IN OC spacing.
  - 4. Design live load:
    - a. 100 PSF, uniform load.
    - b. 300 LBS concentrated load on 4 IN square area.
    - c. All components to be adequate for the uniform load or the concentrated load, whichever requires the stronger component.
    - d. Maximum deflection: 1/300 of span under a superimposed live load of 50 PSF.
  - 5. Cross bars:
    - a. Welded, swaged or pressure locked to bearing bars.
    - b. Maximum 4 IN OC spacing.
  - 6. Top edges of bars: Serrated.
  - 7. Removable grating sections: Not wider than 3 FT and not more than 50 LBS.
  - 8. Ends and perimeter edges: Banded.
  - 9. Openings through grating: Reinforced to provide required load carrying capacity and banded with 4 IN high toe plate.
  - 10. Provide openings at joints between individual grating sections.
  - 11. Clips and bolts: 316 stainless steel.
  - 12. Seat angles: 316 stainless steel.
- C. Structural supports for elevated walkway platform on top of Decant pump station wet well:
- 1. Provide contractor designed grating support.
  - 2. Design live load for elevated walkway grating supporting structure:
    - a. 100 PSF, uniform load.
    - b. 300 LBS concentrated load on 4 IN square area.
    - c. All components to be adequate for the uniform load or the concentrated load, whichever requires the stronger component.
    - d. Maximum deflection: 1/300 of span under a superimposed live load of 100 PSF.
    - e. Grating:
      - 1) Per this Specification Section.
    - f. Structural support: Channel sections with bracing, plates, angles, etc., to support grating.
      - 1) Weld or bolt all connections using stainless steel bolts, nuts and washers.
    - g. Guardrails:
      - 1) Match ladder side rails.
        - a) Space intermediate rails equally between top rail and top of kickplate.
      - 2) Provide 4 IN high x 3/8 IN thick toeboard each side of landing.
- D. Railing:
- 1. Design railings and anchorage system in accordance with NAAMM AMP 521 to resist loading as required by the building code.
    - a. Maximum allowable stresses per AA ADM 1.
  - 2. Design railings in accordance with accessibility requirements per the building code and ADAAG.
  - 3. Custom fabricate railings to dimensions and profiles indicated.
  - 4. Guardrails:
    - a. All Schedule 40 pipe, unless otherwise noted.
    - b. Top rails: 2 IN nominal diameter.
    - c. Intermediate rails: 1-1/2 IN nominal diameter.
    - d. Vertical posts:
      - 1) 2 IN nominal diameter.
      - 2) Vertical posts that are to be side-bracket mounted to a vertical concrete surface or metal structure shall use Alloy 6061-T6 or 6063-T6.
  - 5. Handrail mounted to wall or to guardrail vertical posts: 1-1/4 IN nominal diameter Schedule 40 pipe.
  - 6. Where details are not indicated, space intermediate rails to requirements of the building code or OSHA Standards, whichever requires the more restrictive design.

7. Space vertical posts as required by loading requirements but not more than 4 FT on center.
  - a. Avoid locating vertical posts at changes in direction of railing.
  - b. Hold vertical post back from corner and provide radiused corners.
8. Space handrail brackets as required by loading requirements but not more than 4 FT on center.
9. Base plate for vertical guardrail posts mounted to top of concrete surface:
  - a. 3/8 x 6 x 6 IN square plate.
  - b. Predrilled to accept four anchors.
  - c. Provide a 2 IN DIA x 8 IN long solid aluminum rod welded to the base plate.
  - d. Fit the vertical post over the solid rod and weld the post to the base plate.
10. Base plate for vertical guardrail post mounted to flange of metal structure:
  - a. 3/8 x 3 x 8 IN plate.
  - b. Predrilled to accept two fasteners.
  - c. Provide a 2 IN DIA x 8 IN long solid aluminum rod welded to the base plate.
  - d. Fit the vertical post over the solid rod and weld the post to the base plate.
11. Mounting bracket for vertical guardrail post mounted to vertical concrete surface or web of metal structural member:
  - a. Pair of 3/8 IN angles or bent plates.
  - b. Predrilled to accept two fasteners each.
  - c. Weld angles or bent plates to vertical posts.
  - d. Provide toeboards on walkway side of all elevated walkways, platforms and stair landings, and where indicated on the Drawings or required by OSHA Standards.
    - 1) 4 IN high extruded toeboard with stiffener ribs and angled toe.
      - a) Similar to Wagner, Model "IR94102."
12. Use the following if using a guardrail system which requires a gated opening.
  - a. Guardrail gates:
    - 1) Constructed of same material and sizes as the guardrail system.
    - 2) Width of gate as shown on Drawings.
    - 3) Hinges:
      - a) Cast aluminum.
      - b) Self-closing.
        - (1) Stainless steel torsion spring.
      - c) Similar to Wagner, Model "IR100."
    - 4) Gate latch and stop:
      - a) Cast aluminum.
      - b) Spring-loaded pin latch.
        - (1) Stainless steel spring.
      - c) Similar to Wagner, Model "IR101"

E. Modular Framing System:

1. Materials:
  - a. 316 stainless steel: ASTM A666.
2. Channels and inserts:
  - a. Stainless steel: Minimum 12 GA.
  - b. Channels to have one (1) side with a continuous slot with in-turned lips.
    - 1) Width: 1-5/8 IN.
    - 2) Depth and configuration as necessary for loading conditions.
3. Fittings: Same material as system major components.
4. Fasteners:
  - a. Nuts: Toothed grooves in top of nuts to engage the in-turned lips of channel.
  - b. Bolts: Hex-head cap screws.
  - c. Stainless steel.
5. End caps:
  - a. At each exposed end of each piece mounted on walls, or guardrails, or suspended from framing 7 FT or less above the floor or platform.
    - a) Plastic for all exposed ends 7 FT or more above floor or platform.

- b) Plastic or metallic for all other exposed ends.
- 6. Schedule:
  - a. Interior areas: 316 stainless steel.
- 7. Provide dissimilar materials protection in accordance with Specification Section 09 96 00.

## 2.4 FABRICATION

- A. Verify field conditions and dimensions prior to fabrication.
- B. Form materials to shapes indicated with straight lines, true angles, and smooth curves.
  - 1. Grind smooth all rough welds and sharp edges.
    - a. Round all corners to approximately 1/16 IN nominal radius.
- C. Provide drilled or punched holes with smooth edges.
  - 1. Punch or drill for field connections and for attachment of work by other trades.
- D. Weld Shop Connections:
  - 1. Welds to be continuous fillet type unless indicated otherwise.
  - 2. Full penetration butt weld at bends in stair stringers and ladder side rails.
  - 3. Weld structural steel in accordance with AWS D1.1 using Series E70 electrodes conforming to AWS A5.1/A5.1M.
  - 4. Weld aluminum in accordance with AWS D1.2.
  - 5. Weld stainless steel in accordance with AWS D1.6.
    - a. Treat all welded areas in accordance with ASTM A380.
  - 6. All headed studs to be welded using automatically timed stud welding equipment.
  - 7. Grind smooth welds that will be exposed.
- E. Passivate stainless steel items and stainless steel welds after they have been ground smooth.
  - 1. ASTM A380.
- F. Conceal fastenings where practicable.
- G. Fabricate work in shop in as large assemblies as is practicable.
- H. Tolerances:
  - 1. Rolling:
    - a. ASTM A6.
    - b. When material received from the mill does not satisfy ASTM A6 tolerances for camber, profile, flatness, or sweep, the Contractor is permitted to perform corrective work by the use of controlled heating and mechanical straightening, subject to the limitations of the AISC Specification.
  - 2. Fabrication tolerance:
    - a. Member length:
      - 1) Both ends finished for contact bearing: 1/32 IN.
      - 2) Framed members:
        - a) 30 FT or less: 1/16 IN.
        - b) Over 30 FT: 1/8 IN.
    - b. Member straightness:
      - 1) Compression members: 1/1000 of axial length between points laterally supported.
      - 2) Non-compression members: ASTM A6 tolerance for wide flange shapes.
    - c. Specified member camber (except compression members):
      - 1) 50 FT or less: Minus 0/plus 1/2 IN.
      - 2) Over 50 FT: Minus 0/plus 1/2 IN (plus 1/8 IN per 10 FT over 50 FT).
      - 3) Members received from mill with 75 PCT of specified camber require no further cambering.
      - 4) Beams/trusses without specified camber shall be fabricated so after erection, camber is upward.
      - 5) Camber shall be measured in fabrication shop in unstressed condition.
    - d. At bolted splices, depth deviation shall be taken up by filler plates.
      - 1) At welded joints, adjust weld profile to conform to variation in depth.

- 2) Slope weld surface per AWS requirements.
- e. Finished members shall be free from twists, bends and open joints.
  - 1) Sharp kinks, bends and deviation from above tolerances are cause for rejection of material.
- I. Fabricate grating, ladders and accessories using aluminum.
  - 1. Finish:
    - a. Mill, unless noted otherwise.
    - b. Coat surfaces in contact with dissimilar materials.
      - 1) See Specification Section 09 96 00.
- J. Fabricate grating in accordance with NAAMM MBG 531.
  - 1. Maximum tolerance for difference in depth between grating depth and seat or support angle depth: 1/8 IN.
  - 2. Distance between edge of grating and face of embedded seat angle or face of wall or other structural member: 1/4 IN.
    - a. Tolerance: NAAMM MBG 531.
  - 3. Removable sections: Not wider than 3 FT and not heavier than 60 LBS.
  - 4. Ends and perimeter edges: Banded, with alternate bearing bars welded to band.
    - a. Provide full depth banding unless noted otherwise.
    - b. Banding at trenches and sumps to be 1/4 IN less than grating depth to allow for drainage.
  - 5. Openings through grating: Reinforced to provide required load carrying capacity and banded with 4 IN high toe plate.
  - 6. Provide joints at openings between individual grating sections.
  - 7. Fabricate grating so that bearing bars and cross bars in adjacent sections are aligned.
- K. Fabricate miscellaneous metals in accordance with NAAMM AMP 555.
  - 1. Workmanship: Class 2 unless noted otherwise.
- L. Railing Fabrication:
  - 1. Fit exposed ends of guardrails and handrails with solid terminations.
    - a. Return ends of handrail to wall, but do not attach to wall.
    - b. Where guardrail terminates at a wall, provide a vertical post or end-loop 4 IN off the wall to center of vertical member.
  - 2. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly of units at project site.
  - 3. Install weeps to drain water from hollow sections of railing at exterior and high humidity conditions.
    - a. Drill 1/4 IN weep hole in railings closed at bottom:
      - 1) 1 IN above walkway surface at bottom of posts set in concrete.
      - 2) 1 IN above solid aluminum rod at posts having base plate.
      - 3) At low point of intermediate rails.
    - b. Do not drill weep holes:
      - 1) In bottom of base plate.
  - 4. Expansion joints:
    - a. Joints to be designed to allow expansion and contraction of railing and still meet design loads required.
      - 1) Top rail splices and expansion joints shall be located within 8 IN of post or other support.
      - 2) Where railings span building expansion joints; provide a railing expansion joint in the span crossing the building expansion joint.
    - b. Provide expansion joints in any continuous run exceeding 20 FT in length.
      - 1) Space expansion joints at not more than 40 FT on center.
    - c. Provide minimum 0.10 IN of expansion joint for each 20 FT length of top rail for each 25 DEGF differential between installation temperature and maximum design temperature.
      - 1) Maximum expansion joint width at time of installation shall not exceed 3/8 IN.



- a) Provide additional expansion joints as required to limit expansion joint width.
- d. Provide slip-joint with internal sleeve.
  - 1) Extend slip joint min 2 IN beyond joint at maximum design width.
  - 2) Fasten internal sleeve securely to one side.
    - a) Provide allen-head set screw located in bottom of rail.
    - b) Rivets or exposed screw heads are not acceptable.
- e. Finish:
  - 1) Mill.

## **2.5 SOURCE QUALITY CONTROL**

- A. Surface Preparation:
  - 1. Refer to Specification Section 09 96 00 for surface preparation requirements.
  - 2. All miscellaneous metal fabrication item surfaces shall be inspected and approved by NACE certified coatings inspector prior to application of shop-applied coatings.
    - a. Inspection shall be performed to determine depth of blast profile and cleanliness of surface.
    - b. Fabricator shall reblast and or re-clean surfaces as required until acceptable.
- B. Shop Applied Coating Application:
  - 1. Refer to Specification Section 09 96 00 for coating requirements.
  - 2. After surface has been accepted in writing by NACE certified coatings inspector, fabricator may proceed with application of coatings.
  - 3. Application of coatings shall be observed and certified by NACE certified coatings inspector.

## **2.6 ANCHORAGE**

- A. Sized and provided by fabricator per Section 03 15 19.
- B. All materials shall be stainless steel 316.

# **PART 3 - EXECUTION**

## **3.1 PREPARATION**

- A. Provide items to be built into other construction in time to allow their installation.
  - 1. If such items are not provided in time for installation, cut in and install.
- B. Prior to installation, inspect and verify condition of substrate.
- C. Correct surface defects or conditions which may interfere with or prevent a satisfactory installation.
  - 1. Field welding aluminum is not permitted unless approved in writing by Engineer.

## **3.2 INSTALLATION**

- A. Set metal work level, true to line, plumb.
  - 1. Shim and grout as necessary.
- B. Contractor is solely responsible for safety.
  - 1. Construction means and methods and sequencing of work is the prerogative of the Contractor.
  - 2. Take into consideration that full structural capacity of many structural members is not realized until structural assembly is complete; e.g., until slabs, decks, and diagonal bracing or rigid connections are installed.
  - 3. Partially complete structural members shall not be loaded without an investigation by the Contractor.
  - 4. Until all elements of the permanent structure and lateral bracing system are complete, temporary bracing for the partially complete structure will be required.

- C. Adequate temporary bracing to provide safety, stability and to resist all loads to which the partially complete structure may be subjected, including construction activities and operation of equipment is the responsibility of the Contractor.
  - 1. Plumb, align, and set structural steel members to specified tolerances.
  - 2. Use temporary guys, braces, shoring, connections, etc., necessary to maintain the structural framing plumb and in proper alignment until permanent connections are made, the succeeding work is in place, and temporary work is no longer necessary.
  - 3. Use temporary guys, bracing, shoring, and other work to prevent injury or damage to adjacent work or construction from stresses due to erection procedures and operation of erection equipment, construction loads, and wind.
  - 4. Contractor shall be responsible for the design of the temporary bracing system and must consider the sequence and schedule of placement of such elements and effects of loads imposed on the structural steel members by partially or completely installed work, including work of all other trades.
    - a. If not obvious from experience or from the Drawings, confer with the Engineer to identify those structural steel elements that must be complete before the temporary bracing system is removed.
  - 5. Remove and dispose of all temporary work and facilities off-site.
- D. Examine work-in-place on which specified work is in any way dependent to ensure that conditions are satisfactory for the installation of the work.
  - 1. Report defects in work-in-place which may influence satisfactory completion of the work.
  - 2. Absence of such notification will be construed as acceptance of work-in-place.
- E. Field Measurement:
  - 1. Take field measurements as necessary to verify or supplement dimensions indicated on the Drawings.
  - 2. Contractor responsible for the accurate fit of the work.
- F. Check the elevations of all finished footings or foundations and the location and alignment of all anchor bolts before starting erection.
  - 1. Use surveyor's level.
  - 2. Notify Engineer of any errors or deviations found by such checking.
- G. Framing member location tolerances after erection shall not exceed the frame tolerances listed in the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section.
- H. Erect plumb and level; introduce temporary bracing required to support erection loads.
- I. Use light drifting necessary to draw holes together.
  - 1. Drifting to match unfair holes is not allowed.
- J. Welding:
  - 1. Conform to AWS D1.1 and requirements of the FABRICATION Article in PART 2 of this Specification Section.
  - 2. When joining two (2) sections of steel of different ASTM designations, welding techniques shall be in accordance with a qualified AWS D1.1 procedure.
- K. Shore existing members when unbolting of common connections is required.
  - 1. Use new bolts for rebolting connections.
- L. Clean stored material of all foreign matter accumulated prior to the completion of erection.
- M. Bolt Field Connections: Where practicable, conceal fastenings.
- N. Field Welding:
  - 1. Follow AWS procedures.
  - 2. Grind welds smooth where field welding is required.
- O. Field cutting grating or checkered plate to correct fabrication errors is not acceptable.
  - 1. Replace entire section.

- P. Remove all burrs and radius all sharp edges and corners of miscellaneous plates, angles, framing system elements, etc.
- Q. Unless noted or specified otherwise:
  - 1. Connect steel members to steel members with 3/4 IN DIA ASTM F3125, Grade A325 high strength bolts.
  - 2. Connect aluminum to aluminum with 3/4 IN DIA stainless bolts.
  - 3. Connect aluminum to structural steel using 3/4 IN DIA stainless steel bolts.
    - a. Provide dissimilar metals protection.
  - 4. Connect aluminum and steel members to concrete and masonry using stainless steel mechanical anchor bolts or adhesive anchor bolts unless shown otherwise.
    - a. Provide dissimilar materials protection.
  - 5. Provide washers for all bolted connections.
  - 6. Where exposed, bolts shall extend a maximum of 3/4 IN and a minimum of 1/2 IN above the top of installed nut.
    - a. If bolts are cut off to required maximum height, threads must be dressed to allow nuts to be removed without damage to the bolt or the nuts.
- R. Install and tighten ASTM F3125, Grade A325 high-strength bolts in accordance with the AISC 325, Allowable Stress Design (ASD).
  - 1. Provide hardened washers for all Grade A325 bolts.
    - a. Provide the hardened washer under the element (nut or bolt head) turned in tightening.
- S. After bolts are tightened, upset threads of ASTM A307 bolts or anchor bolts to prevent nuts from backing off.
- T. Secure metal to wood with lag screws of adequate size with appropriate washers.
- U. Do not field splice fabricated items unless said items exceed standard shipping length or change of direction requires splicing.
  - 1. Provide full penetration welded splices where continuity is required.
- V. Provide each fabricated item complete with attachment devices as indicated or required to install.
- W. Anchor such that work will not be distorted nor fasteners overstressed from expansion and contraction.
- X. Set beam and column base plates accurately on nonshrink grout as indicated on Drawings.
  - 1. See Division 03 Specification Sections for non-shrink grout and anchorage.
  - 2. Set and anchor each base plate to proper line and elevation.
    - a. Use metal wedges, shims, or setting nuts for leveling and plumbing columns and beams.
      - 1) Wedges, shims and setting nuts to be of same metal as base plate they support.
      - 2) Tighten nuts on anchor bolts.
    - b. Fill space between bearing surface and bottom of base plate with nonshrink grout.
      - 1) Fill space until voids are completely filled and base plates are fully bedded on wedges, shims, and grout.
    - c. Do not remove wedges or shims.
      - 1) Where they protrude, cut off flush with edge of base plate.
    - d. Fill sleeves around anchor bolts solid with non-shrink grout.
- Y. Tie anchor bolts in position to embedded reinforcing steel using wire.
  - 1. Tack welding prohibited.
    - a. Coat projecting bolt threads and nuts with heavy coat of clean grease.
  - 2. Anchor bolt location tolerance:
    - a. Per Section 03 15 19.
- Z. Attach grating to end and intermediate supports with grating saddle clips and bolts.
  - 1. Maximum spacing: 2 FT OC with minimum of two (2) per side.

2. Attach individual units of aluminum grating together with clips at 2 FT OC maximum with a minimum of two (2) clips per side.
- AA. Coat aluminum surfaces in contact with dissimilar materials in accordance with Specification Section 09 96 00.
- BB. Anchor ladder to concrete with minimum 3/4 IN stainless steel anchor bolts with minimum 6 IN embedment.
- CC. Install handrails and guardrails to meet loading requirements of the building code.
- DD. Install products in accordance with manufacturer's instructions.
- EE. Set work accurately in location, alignment and elevation; plumb, level and true.
1. Measure from established lines and items which are to be built into concrete, masonry or similar construction.
- FF. Align railings prior to securing in place to assure proper matching at butting and expansion joints and correct alignment throughout their length.
1. Provide shims as required.
- GG. Install proper sized expansion joints based on temperature at time of installation and differential coefficient of expansion of materials in all railings as recommended by manufacturer.
1. Lubricate expansion joint splice bar for smooth movement of railing sections.
- HH. Provide removable railing sections where indicated on Drawings.
- II. Attach handrails to walls or guardrail with brackets designed for condition:
1. Provide brackets which provide a minimum 1-1/2 IN clearance between handrail and nearest obstruction.
    - a. Handrails shall not project more than 4-1/2 IN into required stairway width.
  2. Anchor handrail brackets to concrete or masonry walls with 1/2 IN stainless steel adhesive anchors with stainless steel hex head bolts.
- JJ. Anchor railings to concrete with minimum 1/2 IN stainless steel adhesive anchors with stainless steel bolts, nuts and washers unless noted otherwise in the Contract Documents.
1. Where exposed, bolts shall extend minimum 1/2 IN and maximum 3/4 IN above the top nut.
    - a. If bolts are cut off to required height, threads must be dressed to allow nuts to be removed without damage to the bolt or the nut.
    - b. Bevel the top of the bolt after cutting to provide a smooth surface.
- KK. Anchor railings to metal structure with minimum 3/4 IN stainless steel bolts, nuts and washers.
- LL. Install toeboards to fit tight to the walking surface.
1. Attach to railing vertical post with manufacturer's standard mounting clamp:
    - a. Adjustable.
    - b. Designed to engage in extruded slot on back of toeboard.
  2. Provide splice bars, corner splices and brackets:
    - a. Manufacturer's standard items as required for a complete installation.
  3. Notch toeboards at base plates or other obstructions.
  4. Bottom of toeboard shall not exceed 1/4 IN above walking surface.
- MM. Coat aluminum in contact with dissimilar metal or concrete in accordance with Specification Section 09 96 00.
- NN. Provide railings as required for stair construction identified in Specification Section 05 50 00.
- OO. Install guardrail gate plumb and level in location shown on Drawings.
1. Center gate in opening.
  2. Top of gate to match top of guardrail.
  3. Fasten hinges to gate and jamb post:
    - a. Minimum three, 1/4 IN stainless steel countersunk machine screws per leaf.
    - b. Drill and tap into railing and gate vertical posts.

4. Provide not less than two hinges per gate.
5. Install gate latch and stop on strike side of opening.
  - a. Fasten to gate with 1/4 IN stainless steel countersunk machine screws.
  - b. Drill and tap into gate vertical post.
  - c. Drill hole in railing vertical post to receive latch pin.
6. Adjust to provide smooth operation:
  - a. Self-closing and self-latching.

### **3.3 FIELD QUALITY CONTROL**

- A. Tolerances (unless otherwise noted on the Drawings):
  1. Frame placement, after assembly and before welding or tightening.
    - a. Deviation from plumb, level and alignment: 1 IN 500, maximum.
    - b. Displacement of centerlines of columns: 1/2 IN maximum, each side of centerline location shown on Drawings.
    - c. Displacement of centerlines of columns: 1/2 IN maximum, each side of centerline location shown on Drawings.
- B. OWNER Pays for Field Inspection and Testing:
  1. Owner will employ and pay for services of an independent testing agency to inspect and test structural steel shop and field work for compliance with this Specification Section.
  2. Contractor provides sufficient notification and access so inspection and testing can be accomplished.
  3. Contractor pays for retesting of failed tests and for additional testing required when defects are discovered.

### **3.4 CLEANING**

- A. After fabrication, erection, installation or application, clean all miscellaneous metal fabrication surfaces of all dirt, weld slag and other foreign matter.
- B. All stainless steel products in addition to Paragraph A. above:
  1. Remove all heat tint, rusting, discoloration by passivation, ASTM A380, or other acceptable means as listed in NiDI 11 007 as approved by the Engineer.
- C. Provide surface acceptable to receive field applied paint coatings specified in Specification Section 09 96 00.

## **END OF SECTION**



## **SECTION 07 92 00**

### **JOINT SEALANTS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Sealing all joints which will permit penetration of dust, air or moisture.

##### **1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Concrete Institute (ACI):
    - a. 302.1R, Guide for Concrete Floor and Slab Construction.
  - 2. ASTM International (ASTM):
    - a. C834, Standard Specification for Latex Sealants.
    - b. C920, Standard Specification for Elastomeric Joint Sealants.
    - c. C1521, Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
  - 3. NSF International (NSF):
    - a. 61, Drinking Water System Components -- Health Effects.
  - 4. Underwriters Laboratories, Inc. (UL).
- B. Qualifications: Sealant applicator shall have minimum five (5) years experience using products specified on projects with similar scope.

##### **1.3 DEFINITIONS**

- A. Defect(ive): Failure of watertightness or airtightness.
- B. Finish sealant: Sealant material per this specification applied over face of compressible sealant specified, to provide a finished, colored sealant joint.
- C. Installer or Applicator:
  - 1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
  - 2. Installer and applicator are synonymous.
- D. "Seal," "sealing" and "sealant": Joint sealant work.

##### **1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
    - c. Manufacturer's recommendations for joint cleaner, primer, backer rod, tooling and bond breaker.
  - 3. Certification from sealant manufacturer stating product being used is recommended for and is best suited for joint in which it is being applied.
  - 4. Certification of applicator qualification.
- B. Test Results:
  - 1. Provide adhesion test results for each sealant sample including adhesion results compared to adhesion requirements.
  - 2. Manufacturer's authorized factory representative recommended remedial measures for all failing tests.

- C. Samples:
  - 1. Cured sample of each color for Engineer's color selection.
  - 2. Color chart not acceptable.
- D. Informational Submittals:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver material in manufacturer's original unopened containers with labels intact: Labels shall indicate contents and expiration date on material.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Expanding foam sealant:
    - a. Macklanburg Duncan.
    - b. Convenience Products.
    - c. FAI International, Inc.
  - 2. Polyurea joint filler:
    - a. Dayton Superior Specialty Chemical Corporation.
    - b. Euclid Chemical Co.
    - c. L&M Construction Chemicals, Inc.
    - d. BASF.
  - 3. Polyurethane sealants:
    - a. Pecora.
    - b. Sika Chemical Corp.
    - c. BASF.
    - d. Tremco.
  - 4. Backer rod, compressible filler, primer, joint cleaners, bond breaker: As recommended by sealant manufacturer.
- B. Submit request for substitution in accordance with General Provisions Article 5.

### **2.2 MATERIALS**

- A. Sealants - General:
  - 1. Provide colors matching materials being sealed.
  - 2. Where compound is not exposed to view in finished work, provide manufacturer's color which has best performance.
  - 3. Nonsagging sealant for vertical and overhead horizontal joints.
  - 4. Sealants for horizontal joints: Self-leveling pedestrian/traffic grade.
  - 5. Joint cleaner, primer, bond breaker: As recommended by sealant manufacturer.
  - 6. Sealant backer rod and/or compressible filler:
    - a. Closed cell polyethylene, polyethylene jacketed polyurethane foam, or other flexible, nonabsorbent, non-bituminous material recommended by sealant manufacturer to:
      - 1) Control joint depth.
      - 2) Break bond of sealant at bottom of joint.
      - 3) Provide proper shape of sealant bead.
      - 4) Serve as expansion joint filler.
- B. Expanding Foam Sealant:
  - 1. One (1) or two (2) component fire rated moisture cured expanding urethane.
  - 2. Shall not contain formaldehyde.
  - 3. Density: Minimum 1.5 PCF.



4. Closed cell content: Minimum 70 PCT.
  5. R-value: Minimum 5.0/IN.
  6. Flame spread: Less than 25.
  7. Smoke developed: Less than 25.
- C. Polyurea Joint Filler:
1. Two (2) component, semi-rigid material for filling formed or saw-cut control joints in interior concrete slabs.
    - a. Dayton Superior Specialty Chemical Corp. "Joint Fill, Joint Seal, Joint Saver II" as required for condition and recommended by manufacturer.
    - b. Euclid Chemical Co. "EUCO QWIK" joint.
    - c. L&M Construction Chemicals, Inc. "Joint Tite 750 IN.
    - d. BASF MasterSeal "CR100 IN control joint filler.
  2. Comply with ACI 302.1R performance recommendations regarding control and construction joints.
  3. Color: Gray.
- D. Polyurethane Sealant:
1. One (1) or two (2) components.
  2. Paintable.
  3. Meet ASTM C920 Type S or Type M, Grade NS or P, Class 25, Use NT, T, M, A and O.
    - a. Pecora Dynatrol-IXL, Dynatrol II, Urexpam NR-200, NR-201.
    - b. Sika Chemical Corporation Sikaflex-1a, Sikaflex-2C NS/SL.
    - c. BASF MasterSeal NP-1, NP-II, SL-1 SL-2.
    - d. Tremco Dymonic or Dymeric, Vulkem 116,227,45,245.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Before use of any sealant, investigate its compatibility with joint surfaces, fillers and other materials in joint system.
- B. Use only compatible materials.
- C. Where required by manufacturer, prime joint surfaces.
  1. Limit application to surfaces to receive sealant.
  2. Mask off adjacent surfaces.
- D. Provide joint depth for joints receiving polyurea joint filler in accordance with manufacturer's recommendations.

### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions and UL requirements.
- B. Clean all joints.
- C. Make all joints water and airtight.
- D. At changes in direction of joints, joint intersections and where sealant joints interface with other construction, install continuous sealant as necessary to ensure a weather-tight seal.
- E. Make depth of sealing compounds, except expanding foam and polyurea sealant, not more than one-half width of joint, but in no case less than 1/4 IN nor more than 1/2 IN unless recommended otherwise by the manufacturer.
- F. Apply bond breaker where required.
- G. Tool sealants using sufficient pressure to fill all voids.
- H. Upon completion, leave sealant with smooth, even, neat finish.

- I. Where piping, conduit, ductwork, etc., penetrate wall, seal each side of wall opening.
- J. Install expanding foam sealant to minimum 4 IN depth or thickness of wall being penetrated if less than 4 IN or as indicated on Drawings.
  - 1. Provide adequate fire rated backing material as required.
  - 2. Hold material back from exposed face of wall as necessary to allow for installation of backer rod and finish sealant.
    - a. Allow expanding foam sealant to completely cure prior to installing backer rod and finish sealant.
  - 3. Trim off excess material flush with surface of the wall if not providing finished sealant.

### **3.3 SEALANT WORK**

- A. General:
  - 1. Work includes but is not limited to: Sealing all joints which will permit penetration of dust, air, or moisture.
  - 2. Refer to SCHEDULE for materials to be used.
- B. Concrete joints:
  - 1. Isolation joints.
  - 2. Construction, control and expansion joints.
- C. Penetrations of walls, floors and decks.
- D. Other joints where sealant, expanding foam sealant or compressible sealant is indicated.

### **3.4 SCHEDULE**

- A. Furnish sealant as indicated for the following areas:
  - 1. Exterior areas:
    - a. Above grade: Polyurethane.
    - b. Below grade: Polyurethane.
  - 2. Interior areas:
    - a. Wet exposure: Polyurethane.
    - b. Dry exposure: Polyurethane, unless noted otherwise.
  - 3. Immersion:
    - a. Prolonged contact with or immersion in:
      - 1) Potable water:
        - a) Polysulfide.
        - b) NSF 61 approved.
  - 4. Compressible sealant: Where indicated.
  - 5. Interior concrete slab formed or saw-cut control joints: Polyurea joint filler.

**END OF SECTION**

**SECTION 09 96 00**  
**HIGH PERFORMANCE INDUSTRIAL COATINGS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. High performance industrial coatings (HPIC).
  2. Any other coating, thinner, accelerator, inhibitor, etc., specified or required as part of a complete System specified in this Specification Section.
  3. Minimum surface preparation requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. ASTM International (ASTM):
    - a. D3359, Standard Test Methods for Rating Adhesion by Tape Test.
    - b. D4258, Standard Practice for Surface Cleaning Concrete for Coating.
    - c. D4259, Standard Practice for Abrading Concrete.
    - d. D4261, Standard Practice for Surface Cleaning Concrete Masonry Units for Coating.
    - e. D4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
    - f. D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
    - g. D4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
    - h. D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
    - i. D6677, Standard Test Method for Evaluating Adhesion by Knife.
    - j. D7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
    - k. F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
    - l. F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
  2. International Concrete Repair Institute (ICRI):
    - a. 310.2, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
  3. National Association of Pipe Fabricators (NAPF):
    - a. 500-03, Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings:
      - 1) 500-03-04, Abrasive Blast Cleaning for Ductile Iron Pipe.
      - 2) 500-03-05, Abrasive Blast Cleaning for Cast Ductile Iron Fittings.
  4. NSF International (NSF).
    - a. 61, Drinking Water System Components - Health Effects.
  5. The Society for Protective Coatings (SSPC):
    - a. PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements.
    - b. SP 1, Solvent Cleaning.
    - c. SP 16, Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
  6. The Society for Protective Coatings/ NACE International (SSPC/ NACE):
    - a. SP 5/ NACE No. 1, White Metal Blast Cleaning

- b. SP 6/ NACE No. 3, Commercial Blast Cleaning.
  - c. SP 7/ NACE No. 4, Brush-off Blast Cleaning.
  - d. SP 10/ NACE No. 2, Near-White Blast Cleaning.
  - e. SP 13/ NACE No. 6, Surface Preparation of Concrete.
- B. Qualifications:
  - 1. Coating manufacturer's authorized representative shall provide written statement attesting that applicator has been instructed on proper preparation, mixing and application procedures for coatings specified.
  - 2. Applicators shall have minimum of 10 years of experience in application of similar products on similar project.
    - a. Provide references for minimum of three (3) different projects completed in last five (5) years with similar scope of work.
    - b. Include name and address of project, size of project in value (painting) and contact person.
- C. Miscellaneous:
  - 1. Furnish coating through one (1) manufacturer unless noted otherwise.
- D. Deviation from specified MIL thickness or product type is not allowed without written authorization of Engineer.
- E. Material shall not be thinned unless approved, in writing, by coating manufacturer's authorized representative.

### 1.3 DEFINITIONS

- A. Installer or Applicator:
  - 1. Installer or applicator is the person actually installing or applying the product in the field, at the Project site, or at an approved shop facility.
  - 2. Installer and applicator are synonymous.
- B. Approved Factory Finish: Finish on a product in compliance with the finish specified in the Specification Section where the product is specified or in Specification Section 01 61 03.
- C. Holiday:
  - 1. A void, crack, thin spot, foreign inclusion, or contamination in the coating film that significantly lowers the dielectric strength of the coating.
  - 2. May also be identified as a discontinuity or pinhole.
- D. Exposed Exterior Surface:
  - 1. Exterior surface which is exposed to view.
  - 2. Exterior surface which is exposed to weather but not necessarily exposed to view.
- E. Finished Area: An area that is listed in or has finish called for on Room Finish Schedule or is indicated on Drawings to be coated.
- F. Surface Hidden from View:
  - 1. Within pipe chases.
  - 2. Between top side of ceilings and underside of floor or roof structures above.
- G. HPIC: High performance industrial coatings.
  - 1. Epoxies, urethanes, vinyl ester, waterborne vinyl acrylic emulsions, acrylates, silicones, alkyds, acrylic emulsions and any other coating listed as a HPIC.

### 1.4 SUBMITTALS

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Applicator experience qualifications.

- a. No submittal information will be reviewed until Engineer has received and approved applicator qualifications.
- 3. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Manufacturer's application instructions.
  - c. Manufacturer's surface preparation instructions.
  - d. If products being used are manufactured by Company other than listed in the MATERIALS Article of this Specification Section, provide complete individual data sheet comparison of proposed products with specified products including application procedure, coverage rates and verification that product is designed for intended use.
  - e. Contractor's written plan of action for containing airborne particles created by blasting operation and location of disposal of spent contaminated blasting media.
  - f. Coating manufacturer's recommendation on abrasive blasting.
  - g. Manufacturer's recommendation for universal barrier coat.
  - h. Manufacturer's recommendation for providing temporary or supplemental heat or dehumidification or other environmental control measures.
- 4. Results of discontinuity testing indicating any corrective action taken.
- 5. Manufacturer's statement regarding applicator instruction on product use.
- 6. Certification that High Performance Coating Systems proposed for use have been reviewed and approved by Senior Corrosion Specification Specialist employed by the coating manufacturer.
- B. NACE inspector experience qualifications.
- C. Samples:
  - 1. Manufacturer's full line of colors for Engineer's preliminary color selection.
  - 2. After preliminary color selection by Engineer provide two (2) 3 x 5 IN samples of each final color selected.
- D. Informational Submittals:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Approval of application equipment.
  - 3. Applicator's daily records:
    - a. Submit daily records at end of each week in which coating work is performed unless requested otherwise by Engineer's on-site representative.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver in original containers, labeled as follows:
  - 1. Name or type number of material.
  - 2. Manufacturer's name and item stock number.
  - 3. Contents, by volume, of major constituents.
  - 4. Warning labels.
  - 5. VOC content.
- B. Store materials in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 DEG F.

## **1.6 PROJECT CONDITIONS**

- A. Verify that atmosphere in area where coating is to take place is within coating manufacturer's acceptable temperature, humidity and sun exposure limits.
  - 1. Provide temporary heating, shade and/or dehumidification as required to bring area within acceptable limits.
    - a. Provide temporary dehumidification equipment properly sized to maintain humidity levels required by coating manufacturer.
    - b. Provide clean heat with heat exchanger type equipment sufficient in size to maintain temperature on a 24 HR basis.
      - 1) Vent exhaust gases to exterior environment.

- 2) No exhaust gases shall be allowed to vent into the space being coated or any adjacent space.
2. Do not apply coatings in snow, rain, fog or mist.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. High Performance Industrial Coatings:
  - a. Tnemec.
  - b. PPG.
  - c. Or Approved Equal.

B. Submit request for substitution in accordance with General Provisions Article 5.

### 2.2 MATERIALS

A. General:

1. Surface anchor profile shall be in accordance with coating manufacturer's product data sheet.
2. Products of other manufacturers than those listed will be considered for use provided that the product:
  - a. Is of the same generic resin.
  - b. Requires comparable surface preparation.
  - c. Has comparable application requirements.
  - d. Meets the same VOC levels or better.
  - e. Provides the same finish and color options.
  - f. Will withstand the atmospheric or immersion conditions of the location where it is to be applied.
3. Where manufacturer's product data sheet indicates a minimum MIL thickness per coat that is greater than specified herein, MIL thickness for entire coating system shall be increased proportionately.

B. Coatings shall comply with the VOC limits of EPA and California Air Resources Board (CARB).

C. For unspecified materials such as thinner, provide manufacturer's recommended products.

### 2.3 TNEMEC COATING SYSTEMS:

A. The following tables denote Tnemec products for high performance industrial coatings, high temperature coatings, and coating systems by environment.

Environment	Surface Preparation	Prime Coat	Intermediate Coats	Finish Coat
<b>Ferrous Metals (Structural &amp; Miscellaneous Metals)</b>				
Atmospheric	SSPC-SP 6/ NACE No. 3	TN 3.0 to 4.0 MIL Series 66HS	TN 3.0 to 4.0 MIL Series 66HS	TN 3.0 to 4.0 MIL Series 66HS
<b>Non Ferrous Metals, including piping</b>				
Dissimilar Materials Protection	SSPC-SP 2	TN 4.5 to 5.5 MIL Series 66HS		
Atmospheric	SSPC-SP 2	TN 3.0 to 4.0 MIL Series 66HS		TN 3.0 to 4.0 MIL Series 66HS
<b>Ferrous Piping</b>				
Atmospheric	SSPC-SP 6/ NACE No. 3	TN 2.5 to 3.5 MIL Series 94-H <sub>2</sub> O	TN 3.0 to 4.0 MIL Series 66HS	TN 3.0 to 4.0 MIL Series 66HS
Immersion (NSF-61 certified)	SSPC-SP10/NACE 2	TN 2.5 to 3.5 MIL Series 91-H <sub>2</sub> O	TN 7.0 to 8.0 MIL Series 22	TN 7.0 to 8.0 MIL Series 22

Environment	Surface Preparation	Prime Coat	Intermediate Coats	Finish Coat
<b>PVC Piping</b>				
Atmospheric	Hand Sanding/ SSPC-SP 1	TN 3.0 to 4.0 MIL Series 66HS		TN 3.0 to 4.0 MIL Series 66HS

## 2.4 PPG COATING SYSTEM

- A. The following tables denote PPG products for high performance industrial coatings, high temperature coatings, and coating systems by environment.

Environment	Surface Preparation	Prime Coat	Intermediate Coats	Finish Coat
<b>Ferrous Metals (Structural &amp; Miscellaneous Metals)</b>				
Atmospheric	SSPC-SP 6/ NACE No. 3	3-5 MILS DFT Amerlock Series	3-5 MILS DFT Amerlock Series	3-5 MILS DFT Amerlock Series
<b>Non Ferrous Metals, including piping</b>				
Dissimilar Materials Protection	SSPC-SP 2	5-10 MILS DFT Amerlock Series		
Atmospheric	SSPC-SP 2	3-5 MILS DFT Amerlock Series		3-5 MILS DFT Amerlock Series
<b>Ferrous Metal Including Piping</b>				
Dissimilar Materials Protection	SSPC-SP 3	5-10 MILS DFT Amerlock Series		
Atmospheric	SSPC-SP 6/ NACE No. 3	3-5 MILS DFT Amerlock Series		3-5 MILS DFT Amerlock Series
Immersion (NSF-61 certified)	SSPC-SP10/NACE 2	5-6 MIL Amercoat 133		5-6 MIL Amercoat 133
<b>PVC Piping</b>				
Atmospheric	Hand Sanding/ SSPC-SP 1	3-5 MILS DFT Amerlock Series		3-5 MILS DFT Amerlock Series

## PART 3 - EXECUTION

### 3.1 ITEMS TO BE COATED

- A. Interior Areas:
- Piping, valves, fittings, and supports:
    - Do not paint piping scheduled to be insulated.
  - Pumps and motors.
  - Ferrous metal tankage.
  - Ferrous metal process equipment.
    - Items specifically noted on Drawings to be painted.

### 3.2 ITEMS NOT TO BE PAINTED

- A. General: Do not paint items listed in this Article, unless noted otherwise.
- B. Items with Approved Factory Finish: These items may require repair of damaged painted areas or painting of welded connections.
- C. Electrical Equipment.
- D. Moving parts of mechanical and electrical units where painting would interfere with the operation of the unit.
- E. Code labels, equipment identification or rating plates and similar labels, tagging and identification.
- F. Contact surfaces of friction-type structural connections.
- G. Stainless Steel Surfaces, except:

1. Piping where specifically noted to be painted.
  2. Banding as required to identify piping.
- H. Aluminum Surfaces, except:
1. Where specifically shown in the Contract Documents.
  2. Where in contact with concrete.
  3. Where in contact with dissimilar metals.
  4. Appurtenant surfaces as described in the ITEMS TO BE PAINTED article.
- I. Mechanical piping scheduled to be insulated.
- J. Interior of Pipe.
- K. Galvanized Steel Items, unless specifically noted to be painted.

### 3.3 PREPARATION

- A. General:
1. Prepare surfaces to be painted in accordance with coating manufacturer's instructions and this Specification Section unless noted otherwise in this Specification Section.
    - a. Where discrepancy between coating manufacturer's instructions and this Specification Section exists, the more stringent surface preparation shall be provided unless approved otherwise, in writing, by the Engineer.
  2. Remove all dust, grease, oil, compounds, dirt and other foreign matter which would prevent bonding of coating to surface.
  3. Adhere to manufacturer's recoat time surface preparation requirements.
    - a. Surfaces that have exceeded coating manufacturer's published recoat time and/or have exhibited surface chalking shall be prepared prior to additional coating in accordance with manufacturer's published recommendations.
      - 1) Minimum SSPC-SP 7/ NACE No. 4 unless otherwise approved by Engineer.
- B. Protection:
1. Protect surrounding surfaces not to be coated.
  2. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar items; or provide ample in-place protection.
  3. Protect code labels, equipment identification or rating plates and similar labels, tagging and identification.
- C. Prepare and paint before assembly all surfaces which are inaccessible after assembly.
- D. Ferrous Metal:
1. Prepare ductile iron pipe in accordance with pipe manufacturer's recommendations and NAPF.
    - a. All piping, pumps, valves, fittings and any other component used in the water piping system that requires preparation for painting shall be prepared in accordance with requirements for immersion service.
    - b. Prepare all areas requiring patch painting in accordance with recommendations of manufacturer and NAPF.
    - c. Remove bituminous coating per piping manufacturer, paint manufacturer and NAPF recommendations.
      - 1) The most stringent recommendations shall apply.
  2. Complete fabrication, welding or burning before beginning surface preparation.
    - a. Chip or grind off flux, spatter, slag or other laminations left from welding.
    - b. Remove mill scale.
    - c. Grind smooth rough welds and other sharp projections.
  3. Solvent clean in accordance with SSPC-SP 1.
  4. Restore surface of field welds and adjacent areas to original surface preparation.
- E. Non-ferrous Metals:
1. Solvent clean in accordance with SSPC-SP 1 followed by brush-off blast clean in accordance with SSPC-SP 16 to remove zinc oxide and other foreign contaminants.



- a. Provide uniform 1 MIL profile surface.
- F. Preparation by Abrasive Blasting:
  - 1. Schedule the abrasive blasting operation so blasted surfaces will not be wet after blasting and before painting.
  - 2. Provide compressed air for blasting that is free of water and oil.
    - a. Provide accessible separators and traps.
  - 3. Protect nameplates, valve stems, rotating equipment, motors and other items that may be damaged from blasting.
  - 4. All abrasive-blasted ferrous metal surfaces shall be inspected immediately prior to application of paint coatings.
    - a. Inspection shall be performed to determine cleanliness and profile depth of blasted surfaces and to certify that surface has been prepared in accordance with these Specifications.
  - 5. Perform additional blasting and cleaning as required to achieve surface preparation required.
    - a. Re-blast surfaces not meeting requirements of these Specifications.
    - b. Prior to painting, re-blast surfaces allowed to set overnight and surfaces that show rust bloom.
    - c. Surfaces allowed to set overnight or surfaces which show rust bloom prior to painting shall be re-inspected prior to paint application.
  - 6. Profile depth of blasted surface: Not less than 1 MIL or greater than 2 MILS unless required otherwise by coating manufacturer.
  - 7. Ensure abrasive blasting operation does not result in embedment of abrasive particles in paint film.
  - 8. Confine blast abrasives to area being blasted.
    - a. Provide shields of polyethylene sheeting or other such barriers to confine blast material.
    - b. Plug pipes, holes, or openings before blasting and keep plugged until blast operation is complete and residue is removed.
  - 9. Abrasive blasting media may be recovered, cleaned and reused providing Contractor submits, for Engineer's review, a comprehensive recovery plan outlining all procedures and equipment proposed in reclamation process.
  - 10. Properly dispose of blasting material contaminated with debris from blasting operation.
- G. All Plastic Surfaces:
  - 1. Sand using 80-100 grit sandpaper to scarify surfaces.

### 3.4 APPLICATION

- A. General:
  - 1. Thin, mix and apply coatings by brush, roller, or spray in accordance with manufacturer's installation instructions.
    - a. Application equipment must be inspected and approved in writing by coating manufacturer.
  - 2. Temperature and weather conditions:
    - a. Do not paint surfaces when surface temperature is below 50 DEGF unless product has been formulated specifically for low temperature application and application is approved in writing by Engineer and paint manufacturer's authorized representative.
    - b. Avoid painting surfaces exposed to hot sun.
    - c. Do not paint on damp surfaces.
  - 3. Apply materials under adequate illumination.
  - 4. Provide complete coverage to MIL thickness specified.
    - a. Thickness specified is dry MIL thickness.
  - 5. Evenly spread to provide full, smooth coverage.
    - a. All paint systems are "to cover."
      - 1) In situations of discrepancy between manufacturer's square footage coverage rates and MIL thickness, MIL thickness requirements govern.
    - b. When color or undercoats show through, apply additional coats until paint film is of uniform finish and color.

- c. Finished paint system shall be uniform and without voids, bugholes, holidays, laps, brush marks, roller marks, runs, sags or other imperfections.
  - 6. If so directed by Engineer, do not apply consecutive coats until Engineer has had an opportunity to observe and approve previous coats.
  - 7. Work each application of material into corners, crevices, joints, and other difficult to work areas.
  - 8. Avoid degradation and contamination of blasted surfaces and avoid inter-coat contamination.
    - a. Clean contaminated surfaces before applying next coat.
    - b. Intercoat surface cleanliness shall be inspected and approved by the Engineer prior to application of each coat.
  - 9. Smooth out runs or sags immediately, or remove and recoat entire surface.
  - 10. Allow preceding coats to dry before recoating.
    - a. Recoat within time limits specified by coating manufacturer.
    - b. If recoat time limits have expired re-prepare surface in accordance with coating manufacturer's printed recommendations.
  - 11. Allow coated surfaces to cure prior to allowing traffic or other work to proceed.
  - 12. Coat all aluminum in contact with dissimilar materials.
  - 13. When coating rough surfaces which cannot be backrolled sufficiently, hand brush coating to work into all recesses provided that the maximum DFT is not exceeded.
  - 14. Backroll surfaces if paint coatings are spray applied.
- B. Employ services of coating manufacturer's qualified technical representative to ensure that field-applied coatings are compatible with factory-applied or existing coatings.
- 1. Certify through material data sheets.
  - 2. Perform test patch.
    - a. Prepare existing coating surface to receive specified coating system.
    - b. Apply coating to a minimum 1 SQFT area and allow to cure in accordance with manufacturer's recommendations.
    - c. Evaluate adhesion to existing coating:
      - 1) All other substrates: ASTM D6677 and ASTM D3359 (X-cut method).
  - 3. If field-applied coating is found to be not compatible, require the coating manufacturer's technical representative to recommend, in writing, product to be used as barrier coat, thickness to be applied, surface preparation and method of application.
    - a. Perform test patch as described above.
  - 4. At Contractor's option, coatings may be removed, surface re-prepared, and new coating applied using appropriate paint system listed in the MATERIALS Article, Paint Systems paragraph of this Specification Section.
    - a. All damage to surface as result of coating removal shall be repaired to original condition or better by Contractor at no additional cost to Owner.
- C. Prime Coat Application:
- 1. Apply structural steel and miscellaneous steel prime coat in the factory.
    - a. Finish coats shall be applied in the factory.
    - b. Prime coat referred to here is prime coat as indicated in this Specification.
      - 1) Prime coating applied in factory (shop) as part of Fabricator's standard rust inhibiting and protection coating is not acceptable as replacement for specified prime coating.
  - 2. Prime all surfaces indicated to be painted.
    - a. Apply prime coat in accordance with coating manufacturer's written instructions and as written in this Specification Section.
  - 3. Apply zinc-rich primers while under continuous agitation.
  - 4. Brush or spray bolts, welds, edges and difficult access areas with primer prior to primer application over entire surface.
  - 5. Touch up damaged primer coats prior to applying finish coats.
    - a. Restore primed surface equal to surface before damage.

6. All surfaces of steel lintels and steel components of concrete lintels used in wall construction shall be completely painted with both prime and finish coats prior to placing in wall.
- D. Finish Coat Application:
1. Apply finish coats in accordance with coating manufacturer's written instructions and in accordance with this Specification Section; manufacturer instructions take precedent over these Specifications.
  2. Touch up damaged finish coats using same application method and same material specified for finish coat.
    - a. Prepare damaged area in accordance with the PREPARATION Article of this Specification Section.

### **3.5 COLOR CODING**

- A. Coordinate with Owner.

### **3.6 FIELD QUALITY CONTROL**

- A. Application Deficiencies:
1. Surfaces showing runs, laps, brush marks, telegraphing of surface imperfections or other defects will not be accepted.
  2. Surfaces showing evidence of fading, chalking, blistering, delamination or other defects due to improper surface preparation, environmental controls or application will not be accepted.
    - a. Epoxy surfaces showing evidence of chalking or amine blush shall be prepared and recoated as follows:
      - 1) Solvent clean surfaces in accordance with SSPC-SP1 and abrasive blast in accordance with SSPC-SP7/ NACE No. 4.
      - 2) Recoat with intermediate and finish coats in accordance with coating system specified herein.
- B. Provide protection for painted surfaces.
1. Surfaces showing soiling, staining, streaking, chipping, scratches, or other defects will not be accepted.
- C. Contractor Performed Testing:
1. Provide ongoing testing and inspection, including but not limited to the following:
    - a. Measurement and recording of environmental conditions as specified herein.
    - b. Measurement and recording of substrate conditions as specified herein.
    - c. Thickness Testing:
      - 1) Wet film thickness during application in accordance with ASTM D4414.
      - 2) Dry Film Thickness (DFT) in accordance with SSPC-PA 2 and ASTM D7091.
- D. Instrumentation:
1. Provide instrumentation as necessary to measure and record atmospheric and substrate conditions, including but not limited to:
    - a. Dry Film Thickness Gauge.
    - b. Wet Film Thickness Gauge.
    - c. Sling Psychrometer.
    - d. Surface Temperature Gauge.
    - e. Anemometer.
    - f. Moisture Meter.
- E. Maintain Daily Records:
1. Record the following information during application:
    - a. Date, starting time, end time, and all breaks taken by painters.
    - b. Air temperature.
    - c. Relative humidity.
    - d. Dew point.
    - e. Moisture content and pH level of concrete or masonry substrates prior to coating.

- f. Surface temperature of substrate.
  - g. Provisions utilized to maintain work area within manufacturer's recommended application parameters including temporary heating, ventilation, cooling, dehumidification and provisions utilized to mitigate wind blown dust and debris from contaminating the wet paint film.
  - h. Record environmental conditions, substrate moisture content and surface temperature information not less than once every 4 HRS during application.
    - 1) Record hourly when temperatures are below 50 DEGF or above 100 DEGF.
  - 2. Record the following information daily for the paint manufacturer's recommended curing period:
    - a. Date and start time of cure period for each item or area.
    - b. For exterior painting:
      - 1) Sky conditions.
      - 2) Wind speed and direction.
      - 3) Air temperature.
        - a) Dry Bulb.
        - b) Wet Bulb.
      - 4) Relative humidity.
      - 5) Dew point.
      - 6) Surface temperatures.
    - c. Record environmental conditions not less than once every 4 HRS.
      - 1) Record hourly when temperatures are below 50 DEGF or above 100 DEGF.
    - d. Provisions utilized to protect each item or area and to maintain areas within manufacturer's recommended curing parameters.
  - 3. Format for daily record to be computer generated.
- F. Measure wet coating with wet film thickness gages in accordance with ASTM D4414.
- G. Measure coating dry film thickness in accordance with SSPC-PA 2.
- 1. Engineer may measure coating thickness at any time during project to assure conformance with these Specifications.
- H. Measure surface temperature of items to be painted with surface temperature gage specifically designed for such.
- I. Measure substrate humidity with humidity gage specifically designed for such.
- J. Provide wet paint signs.

### **3.7 CLEANING**

- A. Clean paint spattered surfaces.
  - 1. Use care not to damage finished surfaces.
- B. Upon completion of painting, replace hardware, accessories, plates, fixtures, and similar items.
- C. Remove surplus materials, scaffolding, and debris.

## **END OF SECTION**

**SECTION 10 14 00**  
**IDENTIFICATION DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Tag, tape and stenciling systems for equipment, piping, valves, pumps, ductwork and similar items.
  - 2. Hazard and safety signs.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. A13.1, Scheme for the Identification of Piping Systems.
  - 2. The International Society of Automation (ISA).
  - 3. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
    - a. Z535.1, Safety Color Code.
    - b. Z535.2, Environmental and Facility Safety Signs.
    - c. Z535.3, Criteria for Safety Symbols.
    - d. Z535.4, Product Safety Signs and Labels.
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
    - b. 704, Standard System for the Identification of Hazards of Materials for Emergency Response.
  - 5. Occupational Safety and Health Administration (OSHA):
    - a. 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data including:
    - a. Catalog information for all identification systems.
    - b. Acknowledgement that products submitted meet requirements of standards referenced.
  - 3. Identification register, listing all items in PART 3 of this Specification Section to be identified, type of identification system to be used, lettering, location and color.
  - 4. Schedule of Hazard and Safety Signage indicating text and graphics.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. W.H. Brady Co.
  - 2. Panduit.
  - 3. Seton.
  - 4. National Band and Tag Co.
  - 5. Carlton Industries, Inc.
- B. Submit request for substitution in accordance with General Provisions Article 5.

## 2.2 MANUFACTURED UNITS

- A. Type A1 - Round Metal Tags:
  - 1. Materials:
    - a. Aluminum or stainless steel.
    - b. Stainless steel shall be used in corrosive environments.
  - 2. Size:
    - a. Diameter: 1-1/2 IN minimum.
    - b. Thickness: 0.035 IN (20 GA) minimum.
  - 3. Fabrication:
    - a. 3/16 IN minimum mounting hole.
    - b. Legend: Stamped and filled with black coloring.
  - 4. Color: Natural.
- B. Type B1- Square Nonmetallic Tags:
  - 1. Materials: Fiberglass reinforced plastic.
  - 2. Size:
    - a. Surface: 2 x 2 IN minimum.
    - b. Thickness: 100 MILS.
  - 3. Fabrication:
    - a. 3/16 IN mounting hole with metal eyelet.
    - b. Legend: Preprinted and permanently embedded and fade resistant.
  - 4. Color:
    - a. Background: Manufacturer standard or as specified.
    - b. Lettering: Black.
- C. Type B2 - Nonmetallic Signs:
  - 1. Materials: Fiberglass reinforced or durable plastic.
  - 2. Size:
    - a. Surface: As required by text.
    - b. Thickness: 60 MILS minimum.
  - 3. Fabrication:
    - a. Rounded corners.
    - b. Drilled holes in corners with grommets.
    - c. Legend: Preprinted, permanently embedded and fade resistant for a 10 year minimum outdoor durability.
  - 4. Color:
    - a. Background: Manufacturer standard or as specified.
    - b. Lettering: Black.
  - 5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.
- D. Type C - Laminated Name Plates:
  - 1. Materials: Phenolic or DR (high impact) acrylic.
  - 2. Size:
    - a. Surface: As required by text.
    - b. Thickness: 1/16 IN.
  - 3. Fabrication:
    - a. Outdoor rated and UV resistant when installed outdoors.
    - b. Two layers laminated.
    - c. Legend: Engraved through top lamination into bottom lamination.
    - d. Two drilled side holes, for screw mounting.
  - 4. Color: Black top surface, white core, unless otherwise indicated.
- E. Type D - Self-Adhesive Tape Tags and Signs:
  - 1. Materials: Vinyl tape or vinyl cloth.
  - 2. Size:
    - a. Surface: As required by text.

- b. Thickness: 5 MILS minimum.
  - 3. Fabrication:
    - a. Indoor/Outdoor grade.
    - b. Weather and UV resistant inks.
    - c. Permanent adhesive.
    - d. Legend: Preprinted.
    - e. Wire markers to be self-laminating.
  - 4. Color: White with black lettering or as specified.
  - 5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.
- F. Type G - Stenciling System:
- 1. Materials:
    - a. Exterior type stenciling enamel.
    - b. Either brushing grade or pressurized spray can form and grade.
  - 2. Size: As required.
  - 3. Fabrication:
    - a. Legend: As required.
  - 4. Color: Black or white for best contrast.

### **2.3 ACCESSORIES**

- A. Fasteners:
- 1. Bead chain: #6 brass, aluminum or stainless steel.
  - 2. Plastic strap: Nylon, urethane or polypropylene.
  - 3. Screws: Self-tapping, stainless steel.
  - 4. Adhesive, solvent activated.

### **2.4 MAINTENANCE MATERIALS**

- A. Where stenciled markers are provided, clean and retain stencils after completion and include in extra stock, along with required stock of paints and applicators.

## **PART 3 - EXECUTION**

### **3.1 GENERAL INSTALLATION**

- A. Install identification devices at specified locations.
- B. All identification devices to be printed by mechanical process, hand printing is not acceptable.
- C. Attach tags to equipment with sufficient surface or body area with solvent activated adhesive applied to back of each tag.
- D. Attach tags with 1/8 IN round or flat head screws to equipment without sufficient surface or body area, or porous surfaces.
  - 1. Where attachment with screws should not or cannot penetrate substrate, attach with plastic strap.
- E. Single items of equipment enclosed in a housing or compartment to be tagged on outside of housing.
  - 1. Several items of equipment mounted in housing to be individually tagged inside the compartment.

### **3.2 SCHEDULES**

- A. Process Systems:
- 1. General:
    - a. Provide arrows and markers on piping.
      - 1) At 20 FT maximum centers along continuous lines.
      - 2) At changes in direction (route) or obstructions.

- 3) At valves, risers, "T" joints, machinery or equipment.
    - 4) Where pipes pass through floors, walls, ceilings, cladding assemblies and like obstructions provide markers on both sides.
  - b. Position markers on both sides of pipe with arrow markers pointing in flow direction.
    - 1) If flow is in both directions use double headed arrow markers.
  - c. Apply tapes and stenciling in uniform manner parallel to piping.
2. Valves:
  - a. Tag type:
    - 1) Indoor noncorrosive:
      - a) Type A1 - Round Metal Tags.
      - b) Type B1 - Square Nonmetallic Tags.
  - b. Fastener:
    - 1) Type A1: Chain of the same material.
    - 2) Type B1: Stainless steel chain.
  - c. Color: Per ASME A13.1 corresponding to the piping system.
  - d. Legend:
    - 1) Letter height: 1/4 IN minimum.
    - 2) Valve designation as indicated on the Drawings (e.g., "V-xxx").
3. Process equipment (e.g., pumps, pump motors, blowers, air compressors, mixers, mixer motors, etc.):
  - a. Tag type:
    - 1) Type B2 - Nonmetallic Signs.
    - 2) Type D - Self-Adhesive Tape Tags and Signs.
    - 3) Type G - Stenciling System.
  - b. Fastener:
    - 1) Self.
    - 2) Screws.
    - 3) Adhesive.
  - c. Legend:
    - 1) Letter height: 1/2 IN minimum.
    - 2) Equipment designation as indicated on the Drawings (e.g., "Primary Sludge Pump P-xxx").
4. Piping systems:
  - a. Tag type:
    - 1) Indoor locations:
      - a) Type D - Self-Adhesive Tape Tags and Signs.
      - b) Type G - Stenciling System.
  - b. Fastener: Self.
  - c. Color: Per ASME A13.1.
  - d. Legend:
    - 1) Letter height: Manufacturers standard for the pipe diameter.
    - 2) Mark piping in accordance with ASME A13.1.
    - 3) Use piping designation as indicated on the Drawings.
    - 4) Arrow: Single arrow.
5. Tanks (less than 1000 GAL) (e.g., mixing tanks, aging tanks, chemical tank, etc.):
  - a. Tag type:
    - 1) Type D - Self-Adhesive Tape Tags and Signs.
    - 2) Type G - Stenciling System.
  - b. Fastener: Self.
  - c. Legend:
    - 1) Letter height: 2 IN minimum.
    - 2) Equipment designation as indicated on the Drawings (e.g., "Polymer Storage Tank Txxx").
6. Equipment that starts automatically:
  - a. Tag type:
    - 1) Type B2 - Nonmetallic Signs.



- 2) Type D - Self-Adhesive Tape Tags and Signs.
  - b. Fastener:
    - 1) Type B2 - Screw or adhesive.
    - 2) Type D - Self.
  - c. Size: 5 IN x 7 IN
  - d. Legend:
    - 1) OSHA Warning Sign.
    - 2) Description of Warning: "THIS MACHINE STARTS AUTOMATICALLY".
- B. Instrumentation Systems:
- 1. Instrumentation Equipment (e.g., flow control valves, primary elements, etc.):
    - a. Tag type:
      - 1) Indoor noncorrosive:
        - a) Type A1 - Round Metal Tags.
        - b) Type B1 - Square Nonmetallic Tags.
    - b. Fastener:
      - 1) Type A1: Chain of the same material.
      - 2) Type B1: Stainless steel chain.
    - c. Legend:
      - 1) Letter height: 1/4 IN minimum.
      - 2) Equipment ISA designation as indicated on the Drawings (e.g., "FIT-xxx").
  - 2. Enclosure for instrumentation and control equipment, (e.g., PLC control panels, etc.):
    - a. Tag type: Type C - Phenolic Name Plates.
    - b. Fastener: Screws.
    - c. Legend:
      - 1) Letter height: 1/2 IN minimum.
      - 2) Equipment name (e.g., "PLC CONTROL PANEL PCP-xxx").
  - 3. Components inside equipment enclosure, (e.g., PLC's, control relays, contactors, and timers):
    - a. Tag type: Type D - Self-Adhesive Tape Tags.
    - b. Fastener: Self.
    - c. Legend:
      - 1) Letter height: 3/16 IN minimum.
      - 2) Description or function of component (e.g., "PLC-xxx" or "CR-xxx").
  - 4. Through enclosure door mounted components (e.g., selector switches, controller digital displays, etc.):
    - a. Tag type: Type C - Phenolic Name Plates.
    - b. Fastener: Screws.
    - c. Legend:
      - 1) Letter height: 1/4 IN minimum.
      - 2) Component ISA tag number as indicated on the Drawings (e.g., "HS-xxx").
- C. Electrical Systems:
- 1. Panelboards and transformers:
    - a. Tag type: Type C - Phenolic Name Plates.
    - b. Fastener: Screws.
    - c. Legend:
      - 1) Letter height:
        - a) First line: 3/8 IN minimum.
        - b) Subsequent lines: 3/16 IN minimum.
      - 2) First line: Equipment name (e.g., "PANELBOARD LPxxx" or "TRANSFORMER Txxx").
      - 3) Second line (panelboards only): System voltage and phase (e.g., "208/120V, 3PH").
      - 4) Third line:
        - a) Source of power (e.g., "FED FROM MCCxxx LOCATED IN ROOM xxx").
        - b) Include the building name or number if the source is in another building.

- 5) Fourth line: Date installed (e.g., "INSTALLED JULY 20xx").
2. Transfer switches:
  - a. Tag type: Type C - Phenolic Name Plates.
  - b. Fastener: Screws.
  - c. Legend:
    - 1) Letter height:
      - a) First line: 3/8 IN minimum.
      - b) Subsequent lines: 3/16 IN minimum.
    - 2) First line: Equipment name (e.g., "AUTOMATIC TRANSFER SWITCH ATsxxx").
    - 3) Second line: Normal source of power (e.g., "NORMAL SOURCE FED FROM MCCxxx").
    - 4) Third line: Emergency source of power (e.g., "EMERGENCY SOURCE FED FROM SGENxxx").
    - 5) Fourth line: Date installed (e.g., "INSTALLED JULY 20xx").
3. Safety switches, separately mounted circuit breakers and motor starters, VFD's, etc.:
  - a. Tag type: Type C - Phenolic Name Plates.
  - b. Fastener: Screws.
  - c. Legend:
    - 1) Letter height: 1/4 IN minimum.
    - 2) First line: Description of load equipment is connected to (e.g., "PUMP Pxxx").
4. Enclosure for instrumentation and control equipment, (e.g., lighting control panels, etc.):
  - a. Tag type: Type C - Phenolic Name Plates.
  - b. Fastener: Screws.
  - c. Legend:
    - 1) Letter height: 1/2 IN minimum.
    - 2) Equipment name (e.g., "LIGHTING CONTROL PANEL LCPxxx").
5. Components inside equipment enclosures (e.g., circuit breakers, fuses, control power transformers, control relays, contactors, timers, etc.):
  - a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
  - b. Fastener: Self.
  - c. Legend:
    - 1) Letter height: 3/16 IN minimum.
    - 2) Description or function of component (e.g., "M-xxx", "CR-xxx" or "TR-xxx").
6. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
  - a. Tag type: Type C - Phenolic Name Plates.
  - b. Fastener: Screws.
  - c. Legend:
    - 1) Letter height: 1/4 IN minimum.
    - 2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., "HS-xxx").
7. Conductors in control panels and in pull or junction boxes where multiple circuits exist.
  - a. Tag type: Type D - Self-Adhesive Tape Tags.
  - b. Fastener: Self.
  - c. Tag conductor at both ends.
  - d. Legend:
    - 1) Letter height: 1/8 IN minimum.
    - 2) Circuit number or wire number as scheduled on the Drawings or as furnished with the equipment.

## END OF SECTION

**SECTION 26 05 00**  
**ELECTRICAL - BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Basic requirements for electrical systems.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 10 14 00 - Identification Devices.
  - 4. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
  - 5. Section 26 05 33 - Raceways and Boxes.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Aluminum Association (AA):
    - a. ADM, Aluminum Design Manual.
  - 2. American Institute of Steel Construction (AISC):
    - a. Steel Construction Manual.
  - 3. American National Standards Institute (ANSI).
  - 4. ASTM International (ASTM):
    - a. A36/A36M, Standard Specification for Carbon Structural Steel.
    - b. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. C2, National Electrical Safety Code (NESC).
  - 6. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 7. National Electrical Manufacturers Association (NEMA):
  - 8. Underwriters Laboratories, Inc. (UL).
- B. Products to be listed by a Nationally Recognized Testing Laboratory (NRTL) in accordance with applicable product standards.
  - 1. Applicable product standards including, but not limited to, ANSI, FM, IEEE, NEMA and UL.
  - 2. NRTL includes, but is not limited to, CSA Group Testing and Certification (CS), FM Approvals LLC (FM), Intertek Testing Services NA, Inc. (ETL), and Underwriters Laboratories, Inc. (UL).

**1.3 DEFINITIONS**

- A. For the purposes of providing materials and installing electrical work the following definitions shall be used.
  - 1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
  - 2. Architecturally finished interior area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
  - 3. Non-architecturally finished interior area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.

4. Highly corrosive and corrosive area: Areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.
5. Hazardous areas: Class I, II or III areas as defined in NFPA 70.
6. Shop fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

#### **1.4 SUBMITTALS**

- A. Shop Drawings:
  1. See Special Provision 19 for requirements for the mechanics and administration of submittal process.
  2. See Specification Section 01 61 03 and individual specification sections for submittal requirements for products defined as equipment.
  3. General requirements:
    - a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
    - b. Include data sheets that include manufacturer's name and product model number.
      - 1) Clearly identify all optional accessories.
    - c. Acknowledgement that products are NRTL listed or are constructed utilizing NRTL recognized components.
    - d. Manufacturer's delivery, storage, handling and installation instructions.
    - e. Product installation details.
    - f. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70, include any required calculations.
    - g. See individual specification sections for any additional requirements.
  4. Fabrication and/or layout drawings:
    - a. Concrete and reinforcing steel, per Division 03 requirements.
- B. Operation and Maintenance Manuals:
  1. See General Provisions Article 5 for requirements for:
    - a. The mechanics and administration of the submittal process.
    - b. The content process of Operation and Maintenance Manuals.
- C. When a Specification Section includes products specified in another Specification Section, each Specification Section shall have the required Shop Drawing transmittal form per Special Provision 19 and all Specification Sections shall be submitted simultaneously.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. See Specification Section 01 65 50.
- B. Protect nameplates on electrical equipment to prevent defacing.

#### **1.6 AREA DESIGNATIONS**

- A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
  1. Outdoor areas:
    - a. Wet.
    - b. Also, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
  2. Indoor areas:
    - a. Dry.
    - b. Also, wet, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, refer to specific Electrical Specification Sections and specific material paragraphs below for acceptable manufacturers.
- B. Provide all components of a similar type by one (1) manufacturer.

### **2.2 MATERIALS**

- A. Electrical Equipment Support Pedestals and/or Racks:
  - 1. Manufacturers:
    - a. Modular strut:
      - 1) Unistrut Building Systems.
      - 2) B-Line by Eaton.
      - 3) Globe Strut.
      - 4) Superstrut by Thomas & Betts.
      - 5) Or approved equal.
  - 2. Material requirements:
    - a. Modular strut:
      - 1) Galvanized steel: ASTM A123/123M or ASTM A153/A153M.
      - 2) Stainless steel: AISI Type 304.
      - 3) PVC coated galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 MIL PVC coating.
      - 4) Aluminum: AA Type 6063-T6.
    - b. Structural members (e.g., I beams, L and C channels):
      - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
      - 2) Aluminum: AA Type 6061-T6 or 6063-T6.
    - c. Mounting plates:
      - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
      - 2) Aluminum: AA Type 6063-T6.
    - d. Mounting hardware:
      - 1) Galvanized steel.
      - 2) Stainless steel.
    - e. Anchorage per Specification Section 03 15 19.
    - f. Concrete and reinforcing steel: See Division 03 specifications.
- B. Equipment pads (interior and exterior):
  - 1. Concrete and reinforcing steel: See Division 03 specifications.
- C. Field touch-up of galvanized surfaces.
  - 1. Zinc-rich primer.
    - a. One coat, 3.0 MILS, ZRC by ZRC Products.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install and wire all equipment, including pre-purchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specification Sections and ensure that equipment is ready and safe for energization.
- B. Install equipment in accordance with the requirements of:
  - 1. NFPA 70.
  - 2. IEEE C2.

3. The manufacturer's instructions.
- C. In general, conduit routing is not shown on the Drawings.
1. The Contractor is responsible for routing all conduits including those shown on one-line and control block diagrams and home runs shown on floor plans.
  2. Conduit routings and stub-up locations that are shown are approximate; exact routing to be as required for equipment furnished and field conditions.
- D. When complete branch circuiting is not shown on the Drawings:
1. A homerun indicating panelboard name and circuit number will be shown and the circuit number will be shown adjacent to the additional devices (e.g., light fixture and receptacles) on the same circuit.
  2. The Contractor is to furnish and install all conduit and conductors required for proper operation of the circuit.
  3. The indicated home run conduit and conductor size shall be used for the entire branch circuit.
  4. See Specification Section 26 05 19 for combining multiple branch circuits in a common conduit.
- E. Do not use equipment that exceed dimensions or reduce clearances indicated on the Drawings or as required by the NFPA 70.
- F. Install equipment plumb, square and true with construction features and securely fastened.
- G. Install electrical equipment, including pull and junction boxes, minimum of 6 IN from process, gas, air and water piping and equipment.
- H. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operation and maintenance requirements of other equipment.
- I. Device Mounting Schedule:
1. Unless indicated otherwise on the Drawings, mounting heights are as indicated below:
    - a. Light switch (to center): 46 IN.
    - b. Receptacle in architecturally finished areas (to center): 18 IN.
    - c. Receptacle on exterior wall of building (to center): 18 IN.
    - d. Receptacle in non-architecturally finished areas (to center): 46 IN.
    - e. Telephone outlet in architecturally finished areas (to center): 18 IN.
    - f. Telephone outlet for wall-mounted phone (to center): 46 IN.
    - g. Safety switch (to center of operating handle): 54 IN.
    - h. Separately mounted motor starter (to center of operating handle): 54 IN.
    - i. Pushbutton or selector switch control station (to center): 46 IN.
    - j. Panelboard (to top): 72 IN.
- J. Avoid interference of electrical equipment operation and maintenance with structural members, building features and equipment of other trades.
1. When it is necessary to adjust the intended location of electrical equipment, unless specifically dimensioned or detailed, the Contractor may make adjustments of up to 6 IN in equipment location with the Engineer's approval.
- K. Provide electrical equipment support system per the following area designations:
1. Dry areas:
    - a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
    - b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation before rust appears.
  2. Wet areas:
    - a. 316 stainless steel system consisting of 316 stainless steel channels and fittings, nuts and hardware.

- L. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.
  - 1. See Specification Section 03 15 19.
  - 2. Do not cut, or weld to, building structural members.
  - 3. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.
- M. Provide non-metallic corrosion resistant spacers to maintain 1/4 IN separation between metallic equipment and/or metallic equipment supports and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Basins, Clarifiers, Digesters, Reservoirs, etc.
- N. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.
- O. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.
- P. Do not use materials that may cause the walls or roof of a building to discolor or rust.
- Q. Identify electrical equipment and components in accordance with Specification Section 10 14 00.
- R. Provide field markings and/or documentation of available short-circuit current (available fault current) and related information for equipment as required by the NFPA 70 and other applicable codes.
- S. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
  - 1. Determine the SCCR rating by one of the following methods:
    - a. Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
    - b. Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
    - c. Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
  - 2. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the equipment or control panel circuit originates.
  - 3. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

### **3.2 FIELD QUALITY CONTROL**

- A. Verify exact rough-in location and dimensions for connection to electrified equipment, provided by others.
  - 1. See Specification Section 01 73 20 for openings and penetrations in structures.
- B. Replace equipment and systems found inoperative or defective and re-test.
- C. Cleaning:
  - 1. See Specification Section 01 74 13.
- D. The protective coating integrity of support structures and equipment enclosures shall be maintained.
  - 1. Repair galvanized components utilizing a zinc rich paint.
  - 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
  - 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
  - 4. Repair surfaces which will be inaccessible after installation prior to installation.
  - 5. See Specification Section 26 05 33 for requirements for conduits and associated accessories.

- E. Replace nameplates damaged during installation.

**END OF SECTION**



## **SECTION 26 05 09**

### **MOTORS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Induction motors.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 01 61 03 - Equipment - Basic Requirements.
  - 4. Section 26 05 26 - Grounding.
  - 5. Section 26 08 13 - Acceptance Testing.

##### **1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Bearing Manufacturers Association (ABMA).
  - 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. 841, Standard for Petroleum and Chemical Industry - Premium-Efficiency, Severe-Duty, Totally-Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors - Up To and Including 370 kW (500 HP).
  - 3. National Electrical Manufacturers Association (NEMA):
    - a. MG 1, Motors and Generators.
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
- B. Miscellaneous:
  - 1. When motors are furnished with driven equipment, the driven equipment supplier shall be responsible for assembling the motor and driven equipment as a complete unit, correctly aligned and coupled with the coupling or sheave specified on the driven equipment data sheet, and designing for vibration, special, or unbalanced forces resulting from equipment operation.
    - a. See Specification Section 01 61 03 for requirements.
  - 2. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and ensure their compatibility.

##### **1.3 DEFINITIONS**

- A. Inverter Duty Motor: An AC induction motor complying with all requirements of NEMA MG 1 Part 31 for definite-purpose inverter-fed motors.
- B. Abbreviations:
  - 1. DPFG - Dripproof Fully Guarded.
  - 2. ODP - Open Dripproof.
  - 3. RTD - Resistance Temperature Detector.
  - 4. TEFC - Totally Enclosed Fan Cooled.
  - 5. TENV - Totally Enclosed Non-ventilated.
  - 6. WP-I - Weather Protected Type I.
  - 7. WP-II - Weather Protected Type II.
    - a. VFD - Variable Frequency Drive.

## 1.4 SUBMITTALS

- A. Shop Drawings:
  - 1. See Specification Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data:
    - a. Identify each motor by driven machine identification.
    - b. Motor manufacturer and model number.
    - c. Complete motor nameplate data.
    - d. Weight.
    - e. NEMA design type.
    - f. Enclosure type.
    - g. Frame size.
    - h. Winding insulation class and temperature rise.
    - i. Starts per hour.
    - j. Performance data:
      - 1) Motor speed-torque curve superimposed over driven machines speed-torque curve during start-up acceleration and at rated terminal voltage and minimum permissible or specified terminal voltage for all motor over 3HP.
      - 2) Time-current plots with acceleration verses current and thermal damage curves at the operating and ambient temperatures and at rated terminal voltage and minimum permissible or specified terminal voltage for all motors over 3HP.
      - 3) Guaranteed minimum efficiencies at 100 PCT, 75 PCT and 50 PCT of full load.
      - 4) Guaranteed minimum power factor at 100 PCT, 75 PCT and 50 PCT of full load.
      - 5) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
      - 6) Starting, full load and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
    - k. Bearing data and lubrication system.
    - l. Thermal protection system including recommended alarm and trip settings for winding and bearing RTDs.
    - m. Recommended size of power factor correction capacitors to improve power factor to 0.95 lagging when operated at full load.
  - 3. Fabrication and/or layout drawings:
    - a. Dimensioned outline Drawing.
    - b. Connection diagrams including accessories (strip heaters, thermal protection, etc.).
  - 4. Certifications:
    - a. When utilized with a reduced voltage starter, certify that motor and driven equipment are compatible.
  - 5. Test reports:
    - a. Motor test reports for all testing required in this Specification Section.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See Special Provision 19 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
  - 2. Installation instructions.
  - 3. Operation and maintenance instructions.
  - 4. Recommended spare parts list.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. See Specification Section 01 65 50.
- B. Protect equipment during shipment, handling, and storage by suitable boxes, crates, or other complete enclosures.
  - 1. Protect equipment from exposure to elements and keep thoroughly dry.

- C. Protect painted surfaces against impact, abrasion, discoloration, and other damage.
  - 1. Repaint damaged painted surfaces to satisfaction of Engineer.
- D. Store all motors in a clean and dry indoor location until final installation.
- E. Where space heaters are provided in motors, provide temporary electrical power and operate heaters during storage and after motors are installed in permanent location until equipment is placed in service.
- F. For storage longer than one month, see manufacturer's storage instructions.

## **1.6 SITE CONDITIONS**

- A. Ambient air temperature: 60 DEGF.
- B. Altitude: 220 FT above sea level.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. ABB.
  - 2. General Electric.
  - 3. Hyundai Heavy Industries.
  - 4. Marathon.
  - 5. Reliance by Rockwell Automation, Inc.
  - 6. Siemens.
  - 7. TECO-Westinghouse Motor Company.
  - 8. Toshiba U.S.
  - 9. Toshiba Mitsubishi-Electric Industrial Systems Corporation (TMEIC).
  - 10. U.S. Motors by Nidec Motor Corporation.
  - 11. WEG.
  - 12. Or approved equal.

### **2.2 EQUIPMENT**

- A. General Requirements:
  - 1. Standards: NEMA MG 1.
  - 2. Identify each motor by the driven machine identification.
  - 3. An embossed or engraved stainless steel nameplate, with the required NFPA 70 and NEMA data, to be permanently attached to the motor.
  - 4. Maximum motor loading shall not exceed motor nameplate horsepower rating, exclusive of service factor.
  - 5. All motors shall be sized to carry continuously all loads, which may be imposed through their full range of operation.
  - 6. Altitude: For applications above 3300 FT, motors to be specifically designed and certified for operation at the specified altitude.
  - 7. NEMA MG 1, Design B (unless otherwise required), constant speed squirrel-cage induction type having normal starting torque with low starting current.
  - 8. Suitable for the starting method indicated (e.g., full voltage, autotransformer, solid state reduced voltage, VFD, etc.).
  - 9. Where frequent starting occurs, design for frequent starting duty equivalent to duty service required by driven equipment.
  - 10. Lifting devices: Motors weighing 265 LBS or more shall have suitable lifting eyes for installation and removal.
  - 11. Grounding:

- a. Lug suitable to terminate ground wire in terminal box, sized as indicated on the Drawings.
- 12. Stator windings: Copper.
- 13. Rotor cage: Aluminum or copper.
- 14. Motor leads shall be non-wicking with permanent identifiers.
- 15. Totally enclosed motor to have one-way breather drains.
- 16. Efficiency:
  - a. Meet NEMA MG 1 (NEMA Premium) efficiencies.
  - b. If motor type, horsepower or speed is not included in the NEMA requirements for NEMA Premium, provide manufacturers "premium energy efficient" design.
- 17. Power factor:
  - a. Minimum of 80 PCT lagging at full load, except on motors with speed slower than 900 RPM.
  - b. Power factor correction capacitors to be utilized when indicated on the Drawings.
- 18. Service factor:
  - a. 100 HP or less: 1.15.
  - b. Greater than 100 HP: 1.0 unless noted otherwise.
  - c. Inverter duty: 1.0.
- 19. Standards: NEMA MG 1, UL 674, UL 1836.

## **2.3 INDUCTION MOTORS, 600 VOLT AND LESS**

- A. Vertical Solid or Hollow Shaft:
  - 1. Electrical rating:
    - a. Appropriate for the voltage system indicated, 3 PH, 60 Hz.
    - b. Dual voltage rated motors (e.g., 230/460 V) are acceptable, provided all leads are brought out to the terminal box and permanently marked.
  - 2. Enclosure:
    - a. Cast iron.
    - b. Type: DPGF, TEFC, WP-I or WP-II as indicated in the schedule.
  - 3. Terminal box:
    - a. Gasketed.
    - b. Diagonally split.
    - c. Oversized to accept the required conductors and conduits.
  - 4. Bearings (Solid Shaft):
    - a. Relubricatable.
    - b. Antifriction.
    - c. Minimum rated ABMA L-10 life of 10 years or 100,000 HRS.
  - 5. Bearings (Hollow Shaft):
    - a. Relubricatable.
    - b. Antifriction.
    - c. Oil or grease lubricated thrust bearings.
    - d. Grease lubricated guide bearings.
    - e. Minimum rated ABMA L-10 life of 10 years or 100,000 HRS.
  - 6. Insulation:
    - a. Class F insulation with Class B temperature rise.
    - b. Two cycles of vacuum pressure impregnated (VPI) with epoxy resin.
  - 7. Accessories: See the ACCESSORIES Article in PART 2 and the SCHEDULES Article in PART 3.
  - 8. Modifications:
    - a. Inverter duty:
      - 1) At a minimum, applied to motors connected to a VFD.
      - 2) Windings insulated for 1600 peak volts and voltage rise times of 0.1 microseconds.
      - 3) Nameplate identification of meeting NEMA MG 1 Part 31 requirements.
      - 4) Have the following minimum turndown ratio without the use of a blower to provide continuous supply of cooling air over the motor.

- a) Variable torque: 10:1.
- b) Constant torque: 6:1.
- 5) Insulated drive end bearing on all motors.
- 6) Motors 100 HP and larger the non-drive end shall have an insulated bearing carrier.
- 7) Shaft grounding ring on all motors:
  - a) Factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber shaft contacting material.
  - b) Electro Static Technology AEGIS SGR Bearing Protection Ring or approved equal.

## 2.4 ACCESSORIES

- A. Thermal Protection
  - 1. Thermostats:
    - a. One winding thermostat per phase for shutdown.
    - b. One bearing oil thermostat for shutdown.
    - c. Snap action, bi-metallic, temperature-actuated switch type.
    - d. Normally closed, wired in series.
    - e. Automatic reset.
    - f. Switch point shall be pre-calibrated by the manufacturer.

## 2.5 SOURCE QUALITY CONTROL

- A. Test motors in accordance with NEMA, IEEE and manufacturer procedures.
  - 1. The test shall include by not necessarily be limited to the following:
    - a. Routine test:
      - 1) No-load current and speed at rated voltage and frequency.
      - 2) Locked rotor current.
      - 3) Winding resistance.
      - 4) Vibration check.
      - 5) High Potential.
    - b. Complete test (in addition to the routine tests):
      - 1) Rated load temperature rise.
      - 2) Winding resistance.
      - 3) Slip test, measured in percent slip.
      - 4) Locked rotor amperes (3HP, full voltage)
      - 5) Locked rotor torque.
      - 6) Breakdown torque.
      - 7) Efficiencies tabulated at 100, 75, and 50 PCT of full load.
      - 8) Power Factor tabulated at 100, 75, and 50 PCT of full load.
- B. Motors to be tested:
  - 1. As indicated in the schedule.
  - 2. All motors, at a minimum, to receive a routine test.
- C. The Owner reserves the right to select and have tested any motor included within the project.
  - 1. If motor passes testing requirements, the Owner shall be responsible for any shipping and testing cost incurred.
  - 2. Cost shall be determined by current freight rates and manufacturer's published rates at the time of the test.
  - 3. If motor fails test, Supplier shall be responsible for all cost incurred.
  - 4. If two successive motors fail the test, the Owner has the right to reject any or all motors from that manufacturer.
  - 5. The Owner also reserves the right to witness any routine or complete tests at the Owner's expenses.
  - 6. Notify the Owner a minimum of 14 days in advance of the testing.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Ground all motors in accordance with Specification Section 26 05 26.

### **3.2 FIELD QUALITY CONTROL**

- A. Acceptance Testing: See Specification Section 01 61 03.

### **3.3 SCHEDULES**

- A. Motors

DRIVEN MACHINE ID NUMBER	06-P-308	06-P-309	06-P-310
Starter	VFD	VFD	VFD
Horse Power	60	60	60
RPM	1180	1180	1180
Nominal System Voltage	480	480	480
Shaft	Vertical	Vertical	Vertical
Duty	Inverter	Inverter	Inverter
Thermal Protection	T-Stat	T-Stat	T-Stat
Test	Complete	Complete	Complete

**END OF SECTION**

**SECTION 26 05 19**  
**WIRE AND CABLE - 600 VOLT AND BELOW**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Material and installation requirements for:
    - a. Building wire.
    - b. Power cable.
    - c. Control cable.
    - d. Shielded VFD cable.
    - e. Instrumentation cable.
    - f. Wire connectors.
    - g. Insulating tape.
    - h. Pulling lubricant.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 26 05 00 - Electrical - Basic Requirements.
  - 4. Section 26 08 13 - Acceptance Testing.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Insulated Cable Engineers Association (ICEA):
    - a. S-58-679, Standard for Control Cable Conductor Identification.
  - 2. National Electrical Manufacturers Association (NEMA):
    - a. ICS 4, Industrial Control and Systems: Terminal Blocks.
  - 3. National Electrical Manufacturers Association/Insulated Cable Engineers Association (NEMA/ICEA):
    - a. WC 57/S-73-532, Standard for Control Cables.
    - b. WC 70/S-95-658, Non-Shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
    - b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
  - 5. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
    - a. 568, Commercial Building Telecommunications Cabling Standard.
  - 6. Underwriters Laboratories, Inc. (UL):
    - a. 44, Standard for Safety Thermoset-Insulated Wires and Cables.
    - b. 83, Standard for Safety Thermoplastic-Insulated Wires and Cables.
    - c. 467, Standard for Safety Grounding and Bonding Equipment.
    - d. 486A, Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors.
    - e. 486C, Standard for Safety Splicing Wire Connections.
    - f. 510, Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
    - g. 1277, Standard for Safety Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
    - h. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords.
    - i. 2250, Standard for Safety Instrumentation Tray Cable.

### 1.3 DEFINITIONS

- A. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
- B. Instrumentation Cable:
  - 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
  - 2. The following are specific types of instrumentation cables:
    - a. Analog signal cable:
      - 1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 VDC) signals, using No. 16 AWG and smaller conductors.
      - 2) Commonly used types are defined in the following:
        - a) TSP: Twisted shielded pair.
        - b) TST: Twisted shielded triad.
    - b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.
- C. Shielded VFD Cable: Multi-conductor, insulated, with shield, drain wire and building wires, No. 12 and larger.
- D. Power Cable: Multi-conductor, insulated, with outer sheath containing building wire, No. 8 AWG and larger.
- E. Control Cable: Multi-conductor, insulated, with outer sheath containing building wires, No. 14, No. 12 or No. 10 AWG.
- F. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

### 1.4 SUBMITTALS

- A. Shop Drawings:
  - 1. See Specification Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data:
    - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
      - 1) Wire connectors.
      - 2) Insulating tape.
      - 3) Cable lubricant.
    - b. See Specification Section 26 05 00 for additional requirements.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. See Specification Section 26 05 00.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Building wire, power and control cable and multiplex cable:
    - a. Aetna Insulated Wire.
    - b. Alphawire.
    - c. Cerrowire.
    - d. Encore Wire Corporation.
    - e. General Cable.
    - f. Okonite Company.
    - g. Southwire Company.
    - h. Or approved equal.



2. Shielded VFD cable
  - a. Belden Inc.
  - b. General Cable
  - c. Okonite Company
  - d. Olfex Wire and Cable, Inc.
  - e. Priority Wire and Cable (Prysmian).
  - f. Rockbestos Surprenant Cable Corp.
  - g. Southwire Company
  - h. Or approved equal.
3. Instrumentation cable:
  - a. Analog cable:
    - 1) Alphawire.
    - 2) Belden Inc.
    - 3) General Cable.
  - b. Or approved equal.
4. Wire connectors:
  - a. Burndy Corporation.
  - b. Buchanan.
  - c. Ideal.
  - d. Ilsco.
  - e. 3M Co.
  - f. Teledyne Penn Union.
  - g. Thomas and Betts.
  - h. Phoenix Contact.
  - i. Or approved equal.
5. Insulating and color coding tape:
  - a. 3M Co.
  - b. Plymouth Bishop Tapes.
  - c. Red Seal Electric Co.
  - d. Or approved equal.

## 2.2 MANUFACTURED UNITS

- A. Building Wire:
  1. Conductor shall be copper with 600 V rated insulation.
  2. Conductors shall be stranded.
  3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
  4. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 for type XHHW-2 insulation.
- B. Power Cable:
  1. Conductor shall be copper with 600 V rated insulation.
  2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
  3. Conform to NEMA/ICEA WC 70/S-95-658 and UL 83 and UL 1277 for type THHN/THWN insulation with an overall PVC jacket.
  4. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 and UL 1277 for type XHHW-2 insulation with an overall PVC jacket.
  5. Number of conductors as required, including a bare ground conductor.
  6. Individual conductor color coding:
    - a. ICEA S-58-679, Method 4.
    - b. See PART 3 of this Specification Section for additional requirements.
  7. Conform to NFPA 70 Type TC and IEEE 1202.
- C. Control Cable:
  1. Conductor shall be copper with 600 V rated insulation.
  2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.

3. Conform to NEMA/ICEA WC 57/S-73-532 and UL 83 and UL 1277 for type THHN/THWN insulation with an overall PVC jacket.
  4. Conform to NEMA/ICEA WC 57/S-73-532 and UL 44 and UL 1277 for type XHHW-2 insulation with an overall PVC jacket.
  5. Number of conductors as required, provided with or without bare ground conductor of the same AWG size.
    - a. When a bare ground conductor is not provided, an additional insulated conductor shall be provided and used as the ground conductor (e.g., 6/c No. 14 w/g and 7/c No. 14 are equal).
  6. Individual conductor color coding:
    - a. ICEA S-58-679, Method 1, Table E-2.
    - b. See PART 3 of this Specification Section for additional requirements.
  7. Conform to NFPA 70 Type TC and IEEE 1202.
- D. Electrical Equipment Control Wire:
1. Conductor shall be copper with 600 V rated insulation.
  2. Conductors shall be stranded.
  3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
  4. Conform to UL 44 for Type SIS insulation.
  5. Conform to UL 83 for Type MTW insulation.
- E. Shielded VFD Cable:
1. Conductor shall be copper, stranded with 600 V rated insulation.
  2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
  3. Cables No. 1 AWG and less:
    - a. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 and UL 1277 for type RHW-2 or XHHW-2 insulation with an overall PVC jacket.
    - b. Shielding: 85% tinned copper braid, full size tinned copper drain wire and 100% foil shield.
    - c. Number of conductors: 3 PH and 1 full size ground.
  4. Cables No. 12 through 750 kcmil:
    - a. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 type XHHW-2 insulation.
    - b. Shielding: Continuous corrugated copper-free aluminum sheath covered with a PVC jacket or 5 MIL copper tape, longitudinally applied with a minimum overlap of 15%.
    - c. Number of conductors: 3 PH and 3 equally spaced ground conductors.
  5. Individual conductor color coding:
    - a. ICEA S-58-679, Method 4.
    - b. See PART 3 of this Specification Section for additional requirements.
  6. When installed exposed outdoors, UL listed and marked as sunlight resistant.
  7. For continuously corrugated cable, use manufacturer approved fittings.
  8. Conform to NFPA 70, Type TC and IEEE 1202 or CSA FT-4.
- F. Instrumentation Cable:
1. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
  2. Analog cable:
    - a. Tinned copper conductors.
    - b. 600 V PVC insulation with PVC jacket.
    - c. Twisted with 100 PCT foil shield coverage with drain wire.
    - d. Six (6) twists per foot minimum.
    - e. Individual conductor color coding: ICEA S-58-679, Method 1, Table E-2.
    - f. Conform to UL 2250, UL 1581 and NFPA 70 Type ITC.
- G. Wire Connectors:
1. Twist/screw on type:
    - a. Insulated pressure or spring type solderless connector.

- b. 600 V rated.
  - c. Ground conductors: Conform to UL 486C and/or UL 467 when required by local codes.
  - d. Phase and neutral conductors: Conform to UL 486C.
- 2. Compression and mechanical screw type:
  - a. 600 V rated.
  - b. Ground conductors: Conform to UL 467.
  - c. Phase and neutral conductors: Conform to UL 486A.
- 3. Terminal block type:
  - a. High density, screw-post barrier-type with white center marker strip.
  - b. 600 V and ampere rating as required, for power circuits.
  - c. 600 V, 20 ampere rated for control circuits.
  - d. 300 V, 15 ampere rated for instrumentation circuits.
  - e. Conform to NEMA ICS 4 and UL 486A.
- H. Insulating and Color Coding Tape:
  - 1. Pressure sensitive vinyl.
  - 2. Premium grade.
  - 3. Heat, cold, moisture, and sunlight resistant.
  - 4. Thickness, depending on use conditions: 7, 8.5, or 10 MIL.
  - 5. For cold weather or outdoor location, tape must also be all-weather.
  - 6. Color:
    - a. Insulating tape: Black.
    - b. Color coding tape: Fade-resistant color as specified herein.
  - 7. Comply with UL 510.
- I. Pulling Lubricant: Cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Permitted Usage of Insulation Types:
  - 1. Type XHHW-2:
    - a. Building wire and power and control cable in architectural and non-architectural finished areas.
    - b. Building wire and power and control cable in conduit in outdoor areas and below grade.
    - c. Building wire and power and control cable in cable tray in outdoor areas.
  - 2. Type SIS and MTW:
    - a. For the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers.
- B. Conductor Size Limitations:
  - 1. Feeder and branch power conductors shall not be smaller than No. 12 AWG unless otherwise indicated on the Drawings.
  - 2. Control conductors shall not be smaller than No. 14 AWG unless otherwise indicated on the Drawings.
  - 3. Instrumentation conductors shall not be smaller than No. 18 AWG within panels, and No. 16 AWG outside of panels unless otherwise indicated on the Drawings.
- C. Color Code All Wiring as Follows:
  - 1. Building wire:

	240 V, 208 V, 240/120 V, 208/120 V	480 V, 480/277 V
Phase 1	Black	Brown
Phase 2	Red *	Orange

	240 V, 208 V, 240/120 V, 208/120 V	480 V, 480/277 V
Phase 3	Blue	Yellow
Neutral	White	White or Gray
Ground	Green	Green

\* Orange when it is a high leg of a 120/240 V Delta system.

- a. Conductors No. 6 AWG and smaller: Insulated phase, neutral and ground conductors shall be identified by a continuous colored outer finish along its entire length.
  - b. Conductors larger than No. 6 AWG:
    - 1) Insulated phase and neutral conductors shall be identified by one of the following methods:
      - a) Continuous colored outer finish along its entire length.
      - b) 3 IN of colored tape applied at the termination.
    - 2) Insulated grounding conductor shall be identified by one of the following methods:
      - a) Continuous green outer finish along its entire length.
      - b) Stripping the insulation from the entire exposed length.
      - c) Using green tape to cover the entire exposed length.
    - 3) The color coding shall be applied at all accessible locations, including but not limited to: Junction and pull boxes, wireways, manholes and handholes.
  2. Power cables ICEA S-58-679, Method 4 with:
    - a. Phase and neutral conductors identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
    - b. Ground conductor: Bare.
  3. Shielded VFD cable ICEA S-58-679, Method 4 with:
    - a. Phase conductors identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
    - b. Ground conductor: Green color insulation or bare.
  4. Control cables ICEA S-58-679, Method 1, Table E-2:
    - a. When a bare ground is not provided, one of the colored insulated conductors shall be re-identified by stripping the insulation from the entire exposed length or using green tape to cover the entire exposed length.
    - b. When used in power applications the colored insulated conductors used as phase and neutral conductors may have to be re-identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
- D. Install all wiring in raceway unless otherwise indicated on the Drawings.
- E. Feeder, branch, control and instrumentation circuits shall not be combined in a raceway, cable tray, junction or pull box, except as permitted in the following:
1. Where specifically indicated on the Drawings.
  2. Where field conditions dictate and written permission is obtained from the Engineer.
  3. Control circuits shall be isolated from feeder and branch power and instrumentation circuits but combining of control circuits is permitted.
    - a. The combinations shall comply with the following:
      - 1) 12 VDC, 24 VDC and 48 VDC may be combined.
      - 2) 125 VDC shall be isolated from all other AC and DC circuits.
      - 3) AC control circuits shall be isolated from all DC circuits.
  4. Instrumentation circuits shall be isolated from feeder and branch power and control circuits but combining of instrumentation circuits is permitted.
    - a. The combinations shall comply with the following:
      - 1) Analog signal circuits may be combined.
      - 2) Digital signal circuits may be combined but isolated from analog signal circuits.
  5. Multiple branch circuits for similar loads may be combined in a common raceway, such as multiple lighting circuits or multiple receptacle circuits or other 120Vac circuits. Do not combine lighting and receptacle circuits.

- a. Do not combine control device circuits with lighting or receptacle circuits.
  - b. Contractor is responsible for making the required adjustments in conductor and raceway size, in accordance with all requirements of the NFPA 70, including but not limited to:
    - 1) Up sizing conductor size for required ampacity de-ratings for the number of current carrying conductors in the raceway.
    - 2) The neutral conductors may not be shared.
    - 3) Up sizing raceway size for the size and quantity of conductors.
- F. Ground the drain wire of shielded instrumentation cables at one end only.
  - 1. The preferred grounding location is at the load (e.g., control panel), not at the source (e.g., field mounted instrument).
- G. Splices and terminations for the following circuit types shall be made in the indicated enclosure type using the indicated method.
  - 1. Feeder and branch power circuits:
    - a. Device outlet boxes:
      - 1) Twist/screw on type connectors.
    - b. Junction and pull boxes and wireways:
      - 1) Twist/screw on type connectors for use on No. 8 and smaller wire.
      - 2) Compression, mechanical screw or terminal block or terminal strip type connectors for use on No. 6 AWG and larger wire.
    - c. Motor terminal boxes:
      - 1) Twist/screw on type connectors for use on No. 10 AWG and smaller wire.
      - 2) Insulated mechanical screw type connectors for use on No. 8 AWG and larger wire.
    - d. Manholes or handholes:
      - 1) No splices shall be done at any manhole or handhole.
  - 2. Control circuits:
    - a. Junction and pull boxes: Terminal block type connector.
    - b. Manholes or handholes: No splices shall be done an any manhole or handhole.
    - c. Control panels and motor control centers: Terminal block or strips provided within the equipment or field installed within the equipment by the Contractor.
  - 3. Instrumentation circuits can be spliced where field conditions dictate, and written permission is obtained from the Engineer.
    - a. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
    - b. Junction and pull boxes: Terminal block type connector.
    - c. Control panels and motor control centers: Terminal block or strip provided within the equipment or field installed within the equipment by the Contractor.
  - 4. Non-insulated compression and mechanical screw type connectors shall be insulated with tape or hot or cold shrink type insulation to the insulation level of the conductors.
- H. Insulating Tape Usage:
  - 1. For insulating connections of No. 8 AWG wire and smaller: 7 MIL vinyl tape.
  - 2. For insulating splices and taps of No. 6 AWG wire or larger: 10 MIL vinyl tape.
  - 3. For insulating connections made in cold weather or in outdoor locations: 8.5 MIL, all weather vinyl tape.
- I. Color Coding Tape Usage: For color coding of conductors.

### **3.2 FIELD QUALITY CONTROL**

- A. Acceptance Testing:
  - 1. See Specification Section 26 08 13.

## **END OF SECTION**



**SECTION 26 05 26**  
**GROUNDING AND BONDING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Material and installation requirements for grounding and bonding system(s).
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 10 14 00 - Identification Devices.
  - 4. Section 26 05 00 - Electrical - Basic Requirements.
  - 5. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
  - 6. Section 26 05 33 - Raceways and Boxes.
  - 7. Section 26 08 13 - Acceptance Testing.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. ASTM International (ASTM):
    - a. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
  - 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. 837, Standard for Qualifying Permanent Connections Used in Substation Grounding.
  - 3. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 4. Underwriters Laboratories, Inc. (UL):
    - a. 467, Grounding and Bonding Equipment.
- B. Assure ground continuity is continuous throughout the entire Project.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data.
    - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
      - 1) Grounding clamps, terminals and connectors.
      - 2) Exothermic welding system.
    - b. See Specification Section 26 05 00 for additional requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Ground rods and bars and grounding clamps, connectors, and terminals:
    - a. ERICO by Pentair.
    - b. Harger Lightning & Grounding.
    - c. Heary Bros. Lightning Protection Co. Inc.
    - d. Burndy by Hubbell.
    - e. Robbins Lightning, Inc.

- f. Blackburn by Thomas & Betts.
- g. Thompson Lightning Protection, Inc.
- h. Or approved equal.
- 2. Exothermic weld connections:
  - a. ERICO by Pentair - Cadweld.
  - b. Harger Lightning & Grounding - Ultraweld.
  - c. Burndy by Hubbell - Thermoweld.
  - d. FurseWELD by Thomas & Betts.
  - e. Or approved equal.

## 2.2 COMPONENTS

- A. Wire and Cable:
  - 1. Bare conductors: Soft drawn stranded copper meeting ASTM B8.
  - 2. Insulated conductors: Color coded green, per Specification Section 26 05 19.
- B. Conduit: As specified in Specification Section 26 05 33.
- C. Ground Bars:
  - 1. Solid copper:
    - a. 1/4 IN thick.
    - b. 2 or 4 IN wide.
    - c. 24 IN long minimum in main service entrance electrical rooms, 12 IN long elsewhere.
  - 2. Predrilled grounding lug mounting holes.
  - 3. Stainless steel or galvanized steel mounting brackets.
  - 4. Insulated standoffs.
- D. Ground Rods:
  - 1. 3/4 IN x 10 FT.
  - 2. Copper-clad:
    - a. 10 MIL minimum uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
    - b. Corrosion resistant bond between the copper and steel.
    - c. Hard drawn for a scar-resistant surface.
- E. Grounding Clamps, Connectors and Terminals:
  - 1. Mechanical type:
    - a. Standards: UL 467.
    - b. High copper alloy content.
  - 2. Compression type for interior locations:
    - a. Standards: UL 467.
    - b. High copper alloy content.
    - c. Non-reversible.
    - d. Terminals for connection to bus bars shall have two bolt holes.
  - 3. Compression type suitable for direct burial in earth or concrete:
    - a. Standards: UL 467, IEEE 837.
    - b. High copper alloy content.
    - c. Non-reversible.
    - d. Factory filled with oxide inhibiting compound.
- F. Exothermic Weld Connections:
  - 1. Copper oxide reduction by aluminum process.
  - 2. Molds properly sized for each application.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:



1. Install products in accordance with manufacturer's instructions.
  2. Size grounding conductors and bonding jumpers in accordance with NFPA 70, Article 250, except where larger sizes are indicated on the Drawings.
  3. Remove paint, rust, or other non-conducting material from contact surfaces before making ground connections. After connection, apply manufacturers approved touch-up paint to protect metallic surface from corrosion.
  4. Where ground conductors pass through floor slabs or building walls provide nonmetallic sleeves and install sleeve per Specification Section 01 73 20.
    - a. Seal the sleeve interior to stop water penetration.
  5. Do not splice grounding electrode conductors except at ground rods.
  6. Install ground rods and grounding electrode conductors in undisturbed, firm soil.
    - a. Provide excavation required for installation of ground rods and conductors.
    - b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
    - c. Unless otherwise specified, connect conductors to ground rods with compression type connectors or exothermic weld.
    - d. Provide sufficient slack in conductor to prevent conductor breakage during backfill or due to ground movement.
    - e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.
  7. Do not use exothermic welding if it will damage the structure the grounding conductor is being welded to.
- B. Grounding Electrode System:
1. Provide a grounding electrode system in accordance with NFPA 70, Article 250 and as indicated on the Drawings.
    - a. All grounding electrode conductors terminate on a main ground bar located adjacent to the service entrance equipment.
  2. Grounding electrode conductor terminations:
    - a. Ground bars mounted on wall: Use a two-hole compression type conductor terminal and bolt it to the ground bar with two bolts.
    - b. Ground bars in electrical equipment: Use compression type conductor terminal and bolt it to the ground bar or manufacture's provided mechanical type termination device.
    - c. Piping systems: Use mechanical type connections.
    - d. Building steel, below grade and encased in concrete: Use compression type connector or exothermic weld.
    - e. Building steel, above grade: Use a two-hole compression type conductor terminal and bolt to the steel with two bolts or exothermic weld.
    - f. Ground rod: Compression type or exothermic weld, unless otherwise specified.
    - g. At all above grade terminations, the conductors shall be labeled per Specification Section 10 14 00.
- C. Supplemental Grounding Electrode:
1. Provide the following grounding in addition to the equipment ground conductor supplied with the feeder conductors whether or not shown on the Drawings.
    - a. See Grounding Electrode System paragraph for conductor termination requirements.
  2. Metal light poles:
    - a. Connect metal pole and pole base reinforcing steel to a ground rod.
    - b. Grounding conductor: Bare #6 AWG minimum.
  3. Equipment support rack and pedestals mounted outdoors:
    - a. Connect metallic structure to a ground rod.
    - b. Grounding conductor: #6 AWG minimum.
- D. Raceway Bonding/Grounding:
1. Install all metallic raceway so that it is electrically continuous.
  2. Provide an equipment grounding conductor in all raceways with insulation identical to the phase conductors, unless otherwise indicated on the Drawings.

3. NFPA 70 required grounding bushings shall be of the insulating type.
  4. Provide double locknuts at all panels.
  5. Bond all conduits, at entrance and exit of equipment, to the equipment ground bus or lug.
  6. Provide bonding jumpers if conduits are installed in concentric knockouts.
  7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.
- E. Equipment Grounding:
1. Ground all utilization equipment with an equipment grounding conductor.
- F. Manhole and Handhole Grounding:
1. Provide a ground rod and ground bar, when indicated or as needed, in each manhole and handhole with exposed metal parts.
    - a. Expose a minimum of 4 IN of the rod above the floor for field connections to the rod.
  2. Connect all exposed metal parts (e.g., conduits and cable racks) to the ground rod.

### **3.2 FIELD QUALITY CONTROL**

- A. Leave grounding system uncovered until observed by Owner.
- B. Acceptance testing:
1. See Specification Section 26 08 13.

**END OF SECTION**

**SECTION 26 05 33**  
**RACEWAYS AND BOXES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Material and installation requirements for:
    - a. Conduits.
    - b. Conduit fittings.
    - c. Conduit supports.
    - d. Wireways.
    - e. Outlet boxes.
    - f. Pull and junction boxes.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 26 05 00 - Electrical - Basic Requirements.
  - 4. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
  - 5. Section 26 05 43 - Electrical - Exterior Underground.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Aluminum Association (AA).
  - 2. American Iron and Steel Institute (AISI).
  - 3. ASTM International (ASTM):
    - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - c. D2564, Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
  - 4. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
    - c. TC 2, Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
    - d. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
    - e. TC 14.AG, Aboveground Reinforced Thermosetting Resin Conduit and Fittings.
    - f. TC 14.BG, Belowground Reinforced Thermosetting Resin Conduit and Fittings.
  - 5. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
    - a. C80.1, Electric Rigid Steel Conduit (ERSC).
    - b. C80.3, Steel Electrical Metallic Tubing (EMT).
    - c. C80.5, Electrical Aluminum Rigid Conduit (ERAC).
    - d. OS 1, Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 6. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 7. Underwriters Laboratories, Inc. (UL):
    - a. 1, Standard for Flexible Metal Conduit.
    - b. 6, Electrical Rigid Metal Conduit - Steel.
    - c. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
    - d. 360, Standard for Liquid-Tight Flexible Metal Conduit.

- e. 467, Grounding and Bonding Equipment.
- f. 514A, Metallic Outlet Boxes.
- g. 514B, Conduit, Tubing, and Cable Fittings.
- h. 651, Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
- i. 797, Electrical Metallic Tubing - Steel.
- j. 870, Standard for Wireways, Auxiliary Gutters, and Associated Fittings.
- k. 1203, Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.
- l. 2420, Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
- m. 2515, Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

### **1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data:
    - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
      - 1) Conduit fittings.
      - 2) Support systems.
    - b. See Specification Section 26 05 00 for additional requirements.
  - 3. Fabrication and/or layout drawings:
    - a. Identify dimensional size of pull and junction boxes to be used.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. See Specification Section 26 05 00.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Rigid metal conduits:
    - a. Allied Tube and Conduit.
    - b. Western Tube and Conduit Corporation.
    - c. Wheatland Tube.
    - d. Patriot Aluminum Products, LLC.
    - e. Or approved equal.
  - 2. PVC coated rigid metal conduits:
    - a. Ocal by Thomas & Betts.
    - b. Robroy Industries.
    - c. Or approved equal.
  - 3. Rigid nonmetallic conduit:
    - a. Prime Conduit.
    - b. Cantex, Inc.
    - c. Osburn Associates, Inc.
    - d. Champion Fiberglass, Inc.
    - e. United Fiberglass of America, Inc.
    - f. Or approved equal.
  - 4. Flexible conduit:
    - a. AFC Cable Systems.
    - b. Anamet, Inc.
    - c. Electri-Flex Company.
    - d. International Metal Hose Company.

- e. Southwire Company, LLC.
- f. Or approved equal.
- 5. Wireway:
  - a. Hoffman Engineering.
  - b. Wiegmann by Hubbell.
  - c. Square D by Schneider Electric.
  - d. Or approved equal.
- 6. Conduit fittings and accessories:
  - a. Appleton by Emerson Electric Co.
  - b. Carlon by Thomas & Betts.
  - c. Cantex, Inc.
  - d. Crouse-Hinds by Eaton.
  - e. Killark by Hubbell.
  - f. Osburn Associates, Inc.
  - g. O-Z/Gedney by Emerson Electric Co.
  - h. Raco by Hubbell.
  - i. Steel City by Thomas & Betts.
  - j. Thomas & Betts.
  - k. Or approved equal.
- 7. Support systems:
  - a. Unistrut by Atkore International, Inc.
  - b. B-Line by Eaton.
  - c. Kindorf by Thomas & Betts.
  - d. Minerallac Company.
  - e. CADDY by Pentair.
  - f. Superstrut by Thomas & Betts.
  - g. Or approved equal.
- 8. Outlet, pull and junction boxes:
  - a. Appleton by Emerson Electric Co.
  - b. Crouse-Hinds by Eaton
  - c. Killark by Hubbell.
  - d. O-Z/Gedney by Emerson Electric Co.
  - e. Steel City by Thomas & Betts.
  - f. Raco by Hubbell
  - g. Bell by Hubbell.
  - h. Hoffman Engineering.
  - i. Wiegmann by Hubbell.
  - j. B-Line by Eaton.
  - k. Adalet.
  - l. RITTAL North America LLC.
  - m. Stahlin by Robroy Enclosures.
  - n. Or approved equal.

## 2.2 RIGID METAL CONDUITS

- A. Rigid Galvanized Steel Conduit (RGS):
  - 1. Mild steel with continuous welded seam.
  - 2. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing.
  - 3. Threads galvanized after cutting.
  - 4. Internal coating: Baked lacquer, varnish or enamel for a smooth surface.
  - 5. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6.
- B. PVC-Coated Rigid Steel Conduit (PVC-RGS):
  - 1. Nominal 40 MIL Polyvinyl Chloride Exterior Coating:
    - a. Coating: Bonded to hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1.

- b. The bond between the PVC coating and the conduit surface: Greater than the tensile strength of the coating.
- 2. Nominal 2 mil, minimum, urethane interior coating.
- 3. Urethane coating on threads.
- 4. Conduit: Epoxy prime coated prior to application of PVC and urethane coatings.
- 5. Female Ends:
  - a. Have a plastic sleeve extending a minimum of one pipe diameter or 2 IN, whichever is less beyond the opening.
  - b. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
- 6. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6, NEMA RN 1.

## **2.3 RIGID NONMETALLIC CONDUIT**

- A. Schedules 40 (PVC-40) and 80 (PVC-80):
  - 1. Polyvinyl-chloride (PVC) plastic compound which includes inert modifiers to improve weatherability and heat distribution.
  - 2. Rated for direct sunlight exposure.
  - 3. Fire retardant and low smoke emission.
  - 4. Shall be suitable for use with 90 DEGC wire and shall be marked "maximum 90 DEGC".
  - 5. Standards: NFPA 70 Type PVC, NEMA TC 2, UL 651.

## **2.4 FLEXIBLE CONDUIT**

- A. Flexible Galvanized Steel Conduit (FLEX):
  - 1. Formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
  - 2. Standard: NFPA 70 Type FMC, UL 1.
- B. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):
  - 1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
  - 2. Extruded PVC outer jacket positively locked to the steel core.
  - 3. Liquid and vaportight.
  - 4. Standard: NFPA 70 Type LFMC, UL 360.

## **2.5 WIREWAY**

- A. General:
  - 1. Suitable for lay-in conductors.
  - 2. Designed for continuous grounding.
  - 3. Covers:
    - a. Hinged or removable in accessible areas.
    - b. Non-removable when passing through partitions.
  - 4. Finish: Rust inhibiting primer and manufacturer's standard paint inside and out except for stainless steel type.
  - 5. Standards: UL 870, NEMA 250.
- B. General Purpose (NEMA 1 rated) Wireway:
  - 1. 14 or 16 gage steel without knockouts.
  - 2. Cover: Solid, non-gasketed and held in place by captive screws.
- C. Raintight (NEMA 3R) Wiring Trough:
  - 1. 14 or 16 GA galvanized steel without knockouts.
  - 2. Cover: Non-gasketed and held in place by captive screws.
- D. Dusttight (NEMA 12 rated) Wireway:
  - 1. 14 GA steel bodies and covers without knockouts and 10 GA steel flanges.
  - 2. Cover: Fully gasketed and held in place with captive clamp type latches.
  - 3. Flanges: Fully gasketed and bolted.

## 2.6 CONDUIT FITTINGS AND ACCESSORIES

- A. Fittings for Use with RGS:
1. General:
    - a. In hazardous locations listed for use in Class I, Groups C and D locations.
  2. Locknuts:
    - a. Threaded steel or malleable iron.
    - b. Gasketed or non-gasketed.
    - c. Grounding or non-grounding type.
  3. Bushings:
    - a. Threaded, insulated metallic.
    - b. Grounding or non-grounding type.
  4. Hubs: Threaded, insulated and gasketed metallic for raintight connection.
  5. Couplings:
    - a. Threaded straight type: Same material and finish as the conduit with which they are used on.
    - b. Threadless type: Gland compression or self-threading type, concrete tight.
  6. Unions: Threaded galvanized steel or zinc plated malleable iron.
  7. Conduit bodies (ells and tees):
    - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
    - b. Standard and mogul size.
    - c. Cover:
      - 1) Clip-on type with stainless steel screws.
      - 2) Gasketed or non-gasketed galvanized steel, zinc plated cast iron or cast copper free aluminum.
  8. Conduit bodies (round):
    - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
    - b. Cover: Threaded screw on type, gasketed, galvanized steel, zinc plated cast iron or cast copper free aluminum.
  9. Sealing fittings:
    - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
    - b. Standard and mogul size.
    - c. With or without drain and breather.
    - d. Fiber and sealing compound: UL listed for use with the sealing fitting.
  10. Hazardous location flexible coupling (HAZ-FLEX):
    - a. Liquid tight and arc resistant.
    - b. Electrically conductive so no bonding jumper is required.
    - c. Dry and wet areas:
      - 1) Bronze braided covering over flexible brass core.
      - 2) Bronze end fittings.
      - 3) Zinc-plated steel or malleable iron unions and nipples.
    - d. Corrosive areas:
      - 1) Stainless steel braided covering over flexible stainless steel core.
      - 2) Stainless steel end fittings.
      - 3) Aluminum unions and nipples.
  11. Service entrance head:
    - a. Malleable iron, galvanized steel or copper free aluminum.
    - b. Insulated knockout cover for use with a variety of sizes and number of conductors.
  12. Expansion couplings:
    - a. 2 IN nominal straight-line conduit movement in either direction.
    - b. Galvanized steel with insulated bushing.
    - c. Gasketed for wet locations.
    - d. Internally or externally grounded.
  13. Expansion/deflection couplings:
    - a. 3/4 IN nominal straight-line conduit movement in either direction.
    - b. 30 DEG nominal deflection from the normal in all directions.

- c. Metallic hubs, neoprene outer jacket and stainless steel jacket clamps.
  - d. Internally or externally grounded.
  - e. Watertight, raintight and concrete tight.
- 14. Standards: UL 467, UL 514B, UL 1203.
- B. Fittings for Use with PVC-RGS:
  - 1. The same material and construction as those fittings listed under paragraph "Fittings for Use with RGS " and coated as defined under paragraph "PVC Coated Rigid Steel Conduit (PVC-RGS)."
- C. Fittings for Use with FLEX:
  - 1. Connector:
    - a. Zinc plated malleable iron.
    - b. Squeeze or clamp-type.
  - 2. Standard: UL 514B.
- D. Fittings for Use with FLEX-LT:
  - 1. Connector:
    - a. Straight or angle type.
    - b. Metal construction, insulated and gasketed.
    - c. Composed of locknut, grounding ferrule and gland compression nut.
    - d. Liquid tight.
  - 2. Standards: UL 467, UL 514B.
- E. Fittings for Use with Rigid Nonmetallic PVC Conduit:
  - 1. Coupling, adapters and conduit bodies:
    - a. Same material, thickness, and construction as the conduits with which they are used.
    - b. Homogeneous plastic free from visible cracks, holes or foreign inclusions.
    - c. Bore smooth and free of blisters, nicks or other imperfections which could damage the conductor.
  - 2. Solvent cement for welding fittings shall be supplied by the same manufacturer as the conduit and fittings.
  - 3. Standards: ASTM D2564, NEMA TC 3, UL 651, UL 514B.
- F. Weather and Corrosion Protection Tape:
  - 1. PVC based tape, 10 mils thick.
  - 2. Protection against moisture, acids, alkalis, salts and sewage and suitable for direct bury.
  - 3. Used with appropriate pipe primer.

## **2.7 ALL RACEWAY AND FITTINGS**

- A. Mark Products:
  - 1. Identify the nominal trade size on the product.
  - 2. Stamp with the name or trademark of the manufacturer.

## **2.8 PULL AND JUNCTION BOXES**

- A. NEMA 1 Rated:
  - 1. Body and cover: 14 GA minimum, galvanized steel or 14 GA minimum, steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
  - 2. With or without concentric knockouts on four sides.
  - 3. Flat cover fastened with screws.
- B. NEMA 4X Rated (metallic):
  - 1. Body and cover: 14 GA Type 304 or 316 stainless steel.
  - 2. Seams continuously welded and ground smooth.
  - 3. No knockouts.
  - 4. External mounting flanges.
  - 5. Hinged door and stainless steel screws and clamps.
  - 6. Door with oil-resistant gasket.



- C. NEMA 4X Rated (Nonmetallic):
  - 1. Body and cover: Ultraviolet light protected fiberglass-reinforced polyester boxes.
  - 2. No knockouts.
  - 3. External mounting flanges.
  - 4. Hinged door with quick release latches and padlocking hasp.
  - 5. Door with oil resistant gasket.
- D. NEMA 12 Rated:
  - 1. Body and cover:
    - a. 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
    - b. Type 5052 H-32 aluminum, unpainted.
  - 2. Seams continuously welded and ground smooth.
  - 3. No knockouts.
  - 4. External mounting flanges.
  - 5. Non-hinged cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
  - 6. Flat door with oil resistant gasket.
- E. Miscellaneous Accessories:
  - 1. Rigid handles for covers larger than 9 SQFT or heavier than 25 LBS.
  - 2. Split covers when heavier than 25 LBS.
  - 3. Weldnuts for mounting optional panels and terminal kits.
  - 4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 amperes minimum.
- F. Standards: NEMA 250, UL 50.

## 2.9 SUPPORT SYSTEMS

- A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
  - 1. Material requirements.
    - a. Galvanized steel: ASTM A123/A123M or ASTM A153/A153M.
    - b. Stainless steel: AISI Type 316.
    - c. PVC coat galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 MIL PVC coating.
- B. Single Conduit and Outlet Box Support Fasteners:
  - 1. Material requirements:
    - a. Zinc plated steel.
    - b. Stainless steel.
    - c. Malleable iron.
    - d. PVC coat malleable iron or steel: 20 MIL PVC coating.
    - e. Steel protected with zinc phosphate and oil finish.

## 2.10 OPENINGS AND PENETRATIONS IN WALLS AND FLOORS

- A. Sleeves, smoke and fire stop fitting through walls and floors:
  - 1. See Specification Section 01 73 20.

## PART 3 - EXECUTION

### 3.1 RACEWAY INSTALLATION - GENERAL

- A. Shall be in accordance with the requirements of:
  - 1. NFPA 70.
  - 2. Manufacturer instructions.
- B. Size of Raceways:
  - 1. Raceway sizes are shown on the Drawings, if not shown on the Drawings, then size in accordance with NFPA 70.

2. Unless specifically indicated otherwise, the minimum raceway size shall be:
  - a. Conduit: 3/4 IN.
  - b. Wireway: 2-1/2 IN x 2-1/2 IN.
- C. Field Bending and Cutting of Conduits:
  1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
  2. Do not reduce the internal diameter of the conduit when making conduit bends.
  3. Prepare tools and equipment to prevent damage to the PVC coating.
  4. Degrease threads after threading and apply a zinc rich paint.
  5. Debur interior and exterior after cutting.
- D. Male threads of conduit systems shall be coated with an electrically conductive anti-seize compound.
- E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
  1. Repair galvanized components utilizing a zinc rich paint.
  2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
  3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit; or a self-adhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape.
    - a. Total nominal thickness: 40 MIL.
  4. Repair surfaces which will be inaccessible after installation prior to installation.
- F. Remove moisture and debris from conduit before wire is pulled into place.
  1. Pull mandrel with diameter nominally 1/4 IN smaller than the interior of the conduit, to remove obstructions.
  2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
  3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.
- G. Only nylon or polyethylene rope shall be used to pull wire and cable in conduit systems.
- H. Where portions of a raceway are subject to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway shall be sealed to prevent circulation of warm air to colder section of the raceway.
- I. Fill openings in walls, floors, and ceilings and finish flush with surface.
  1. See Specification Section 01 73 20.

### **3.2 RACEWAY ROUTING**

- A. Raceways shall be routed in the field unless otherwise indicated.
  1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
  2. Run in straight lines parallel to or at right angles to building lines.
  3. Do not route conduits:
    - a. Through areas of high ambient temperature or radiant heat.
    - b. In suspended concrete slabs.
    - c. In concrete members including slabs, slabs on grade, beams, walls, and columns unless specifically located and detailed on structural Drawings.
  4. Locate sleeves or conduits penetrating floors, walls, and beams so as not to significantly impair the strength of the construction. Do not place conduit penetrations in columns.
  5. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.
  6. Provide pull boxes or conduit bodies as needed so that there is a maximum of 360 DEG of bends in the conduit run or in long straight runs to limit pulling tensions.

- B. All conduits within a structure shall be installed exposed except as follows:
  - 1. As indicated on the Drawings.
  - 2. Concealed above gypsum wall board or acoustical tile suspended ceilings.
  - 3. Conduits in architecturally finished areas shall be concealed.
- C. Maintain minimum spacing between parallel conduit and piping runs in accordance with the following when the runs are greater than 30 FT:
  - 1. Between instrumentation and telecommunication: 1 IN.
  - 2. Between instrumentation and 125 V, 48 V and 24 VDC, 2 IN.
  - 3. Between instrumentation and 600 V and less AC power or control: 6 IN.
  - 4. Between instrumentation and greater than 600 VAC power: 12 IN.
  - 5. Between telecommunication and 125 V, 48 V and 24 VDC, 2 IN.
  - 6. Between telecommunication and 600 V and less AC power or control: 6 IN.
  - 7. Between telecommunication and greater than 600 VAC power: 12 IN.
  - 8. Between 125 V, 48 V and 24 VDC and 600 V and less AC power or control: 2 IN.
  - 9. Between 125 V, 48 V and 24 VDC and greater than 600 VAC power: 2 IN.
  - 10. Between 600 V and less AC and greater than 600 VAC: 2 IN.
  - 11. Between process, gas, air and water pipes: 6 IN.
- D. Conduits shall be installed to eliminate moisture pockets.
  - 1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.
- E. Conduit shall not be routed on the exterior of structures except as specifically indicated on the Drawings.
- F. Where sufficient room exists within the housing of roof-mounted equipment, the conduit shall be stubbed up inside the housing.
- G. Provide all required openings in walls, floors, and ceilings for conduit penetration.
  - 1. See Specification Section 01 73 20.

### **3.3 RACEWAY APPLICATIONS**

- A. Permitted Raceway Types Per Wire or Cable Types:
  - 1. Power wire or cables: All raceway types.
  - 2. Control wire or cables: All raceway types.
  - 3. Instrumentation cables: Metallic raceway except nonmetallic may be used underground.
  - 4. Motor leads from a VFD: RGS, RAC or shielded VFD cables in all other raceways.
  - 5. Telecommunication cables: All raceway types.
- B. Permitted Raceway Types Per Area Designations:
  - 1. Dry areas:
    - a. RGS.
    - b. RAC.
  - 2. Wet areas:
    - a. PVC-RGS.
  - 3. Corrosive areas:
    - a. PVC-RGS.
    - b. RAC.
  - 4. Highly corrosive areas:
    - a. PVC-RGS.
    - b. PVC-80.
  - 5. NFPA 70 hazardous areas:
    - a. RGS.
    - b. RAC when required by other area designations.

- C. Permitted Raceway Types Per Routing Locations:
1. In stud framed walls:
    - a. RGS
  2. In concrete block or brick walls:
    - a. PVC-40.
  3. Embedded in poured concrete walls and floors:
    - a. PVC-40.
    - b. PVC-RGS when emerging from concrete into areas designated as wet, corrosive or highly corrosive.
  4. Beneath floor slab-on-grade:
    - a. PVC-40.
  5. Through floor penetrations, see Specification Section 01 73 20:
    - a. PVC-RGS in areas designated as wet, corrosive or highly corrosive.
  6. Direct buried conduits and ductbanks:
    - a. PVC-80.
    - b. 90 DEG elbows for transitions to above grade:
      - 1) PVC-RGS.
    - c. Long sweeping bends greater than 15 DEG:
      - 1) PVC-RGS.
  7. Concrete encased ductbanks:
    - a. PVC-40.
    - b. PVC-EB.
    - c. 90 degree elbows for transitions to above grade:
      - 1) PVC-RGS.
    - d. Long sweeping bends greater than 15 DEG:
      - 1) RGS for sizes 2 IN and larger.
- D. FLEX conduits shall be installed for connections to light fixtures, HVAC equipment and other similar devices above the ceilings.
1. The maximum length shall not exceed:
    - a. 6 FT to light fixtures.
    - b. 3 FT to all other equipment.
- E. FLEX-LT conduits shall be installed as the final conduit connection to light fixtures, dry type transformers, motors, electrically operated valves, instrumentation primary elements, and other electrical equipment that is liable to vibrate.
1. The maximum length shall not exceed:
    - a. 6 FT to light fixtures.
    - b. 3 FT to motors.
    - c. 2 FT to all other equipment.
- F. HAZ-FLEX coupling shall be installed as the final conduit to motors, electrically operated valves, instrumentation primary elements and electrical equipment that is liable to vibrate.
1. The maximum length shall not exceed:
    - a. 3 FT to motors.
    - b. 2 FT to all other equipment.
- G. NEMA 1 Rated Wireway:
1. Surface mounted in electrical rooms.
  2. Surface mounted above removable ceilings tiles of an architecturally finished area.
- H. NEMA 3R Wiring Trough:
1. Surface mounted in exterior locations.
- I. NEMA 12 Rated Wireway:
1. Surface mounted in areas designated as dry in architecturally and non-architecturally finished areas.
- J. Underground Conduit: See Specification Section 26 05 43.

### 3.4 CONDUIT FITTINGS AND ACCESSORIES

- A. Conduit Seals:
  - 1. Installed in conduit systems located in hazardous areas as required by the NFPA 70.
  - 2. Fill plug and drain shall be accessible.
  - 3. Pour the conduit seals in a two-step process.
    - a. Pour the seal and leave cover off.
    - b. After seal is dry, inspect for proper sealing, install cover and mark (for example, paint or permanent marker) as complete.
- B. Rigid nonmetallic conduit and fittings shall be joined utilizing solvent cement.
  - 1. Immediately after installation of conduit and fitting, the fitting or conduit shall be rotated 1/4 turn to provide uniform contact.
- C. Install Expansion Fittings:
  - 1. Where conduits are exposed to the sun and conduit run is greater than 200 FT.
  - 2. Elsewhere as identified on the Drawings.
- D. Install Expansion/Deflection Fittings:
  - 1. Where conduits enter a structure.
    - a. Except electrical manholes and handholes.
    - b. Except where the ductbank is tied to the structure with rebar.
  - 2. Where conduits span structural expansions joints.
  - 3. Elsewhere as identified on the Drawings.
- E. Threaded connections shall be made wrench-tight.
- F. Conduit joints shall be watertight:
  - 1. Where subjected to possible submersion.
  - 2. In areas classified as wet.
  - 3. Underground.
- G. Terminate Conduits:
  - 1. In metallic outlet boxes:
    - a. RGS:
      - 1) Conduit hub and locknut.
      - 2) Insulated bushing and two locknuts.
      - 3) Use grounding type locknut or bushing when required by NFPA 70.
  - 2. In NEMA 1 rated enclosures:
    - a. RGS:
      - 1) Conduit hub and locknut.
      - 2) Insulated bushing and two locknuts.
      - 3) Use grounding type locknut or bushing when required by NFPA 70.
  - 3. In NEMA 12 rated enclosures:
    - a. Watertight, insulated and gasketed hub and locknut.
    - b. Use grounding type locknut or bushing when required by NFPA 70.
  - 4. In NEMA 4 and NEMA 4X rated enclosures:
    - a. Watertight, insulated and gasketed hub and locknut.
  - 5. When stubbed up through the floor into floor mount equipment:
    - a. With an insulated grounding bushing on metallic conduits.
    - b. With end bells on nonmetallic conduits.
- H. Threadless couplings shall only be used to join new conduit to existing conduit when the existing conduit end is not threaded, and it is not practical or possible to cut threads on the existing conduit with a pipe threader.

### 3.5 CONDUIT SUPPORT

- A. Permitted multi-conduit surface or trapeze type support system per area designations and conduit types:
  - 1. Dry or wet and/or hazardous areas:

- a. 316 Stainless Steel: Stainless Steel channels and fittings, nuts and hardware and conduit clamps.
- B. Permitted single conduit support fasteners per area designations and conduit types:
  - 1. Architecturally finished areas:
    - a. Material: Zinc plated steel, or steel protected with zinc phosphate and oil finish.
    - b. Types of fasteners: Spring type hangers and clips, straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
    - c. Provide anti-rattle conduit supports when conduits are routed through metal studs.
  - 2. Dry or wet and/or hazardous areas: Same as Corrosive Areas below.
  - 3. Corrosive areas:
    - a. Material: Stainless steel.
    - b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
- C. Conduit Support General Requirements:
  - 1. Maximum spacing between conduit supports per NFPA 70.
  - 2. Support conduit from the building structure.
  - 3. Do not support conduit from process, gas, air or water piping; or from other conduits.
  - 4. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 LBS.
    - a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
    - b. Conduit hangers:
      - 1) Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.
    - c. Do not use suspended ceiling support systems to support raceways.
    - d. Hangers in metal roof decks:
      - 1) Utilize fender washers.
      - 2) Not extend above top of ribs.
      - 3) Not interfere with vapor barrier, insulation, or roofing.
  - 5. Conduit support system fasteners:
    - a. Use sleeve-type expansion anchors as fasteners in masonry wall construction.
    - b. Do not use concrete nails and powder-driven fasteners.

### **3.6 OUTLET, PULL AND JUNCTION BOX INSTALLATION**

- A. General:
  - 1. Install products in accordance with manufacturer's instructions.
  - 2. See Specification Section 26 05 00 and the Drawings for area classifications.
  - 3. Fill unused punched-out, tapped, or threaded hub openings with insert plugs.
  - 4. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.
- B. Pull and Junction Boxes:
  - 1. Install pull or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections.
    - a. Make covers of boxes accessible.
  - 2. Permitted uses of NEMA 1 enclosure:
    - a. Pull or junction box surface mounted above removable ceiling tiles of an architecturally finished area.
  - 3. Permitted uses of NEMA 4X metallic enclosure:
    - a. Pull or junction box surface mounted in areas designated as wet and/or corrosive.
  - 4. Permitted uses of NEMA 12 enclosure:
    - a. Pull or junction box surface mounted in areas designated as dry.

### **END OF SECTION**

**SECTION 26 05 43**  
**ELECTRICAL - EXTERIOR UNDERGROUND**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Material and installation requirements for:
    - a. Manholes.
    - b. Handhole.
    - c. Underground conduits and ductbanks.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Division 03 - Concrete.
  - 4. Section 10 14 00 - Identification Devices.
  - 5. Section 26 05 26 - Grounding.
  - 6. Section 26 05 33 - Raceways and Boxes.
  - 7. Section 31 23 33 - Trenching, Backfilling and Compacting for Utilities.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Association of State Highway and Transportation Officials (AASHTO):
    - a. HB-17, Standard Specifications for Highway Bridges.
  - 2. ASTM International (ASTM):
    - a. A536, Standard Specification for Ductile Iron Castings.
  - 3. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 4. Society of Cable Telecommunications Engineers (SCTE):
    - a. 77, Specifications for Underground Enclosure Integrity.

**1.3 DEFINITIONS**

- A. Direct-Buried Conduit(s):
  - 1. Individual (single) underground conduit.
  - 2. Multiple underground conduits, arranged in one or more planes, in a common trench.
- B. Concrete Encased Ductbank: An individual (single) or multiple conduit(s), arranged in one or more planes, encased in a common concrete envelope.

**1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data:
    - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
  - 3. Fabrication and/or layout drawings:
    - a. Provide dimensional drawings of each manhole indicating all specified accessories and conduit entry locations.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Prefabricated composite handholes:
    - a. Armorcast Products Company.
    - b. Quazite by Hubbell.
    - c. Synertech by Oldcastle Enclosure Solutions.
    - d. Or approved equal.
  - 2. Precast manholes and handholes:
    - a. Lister Industries Ltd.
    - b. Oldcastle Enclosure Solutions.
    - c. Jensen Precast and Utility Concrete Products.
    - d. Or approved equal.
  - 3. Manhole and handhole and ductbank accessories:
    - a. Cantex, Inc.
    - b. Condux International, Inc.
    - c. Neenah Enterprises, Inc.
    - d. Prime Conduit.
    - e. Thomas and Betts.
    - f. Underground Devices, Inc.
    - g. Unistrut by Atkore International, Inc.
    - h. Or approved equal.

### **2.2 MANHOLES AND HANDHOLES**

- A. Prefabricated Composite Material Handholes:
  - 1. Handhole body and cover: Fiberglass reinforced polymer concrete conforming to all test provisions of SCTE 77.
  - 2. Minimum load ratings: SCTE 77 Tier 5.
  - 3. Open bottom.
  - 4. Stackable design as required for specified depth.
  - 5. Cover:
    - a. Engraved legend of "ELECTRIC" or "COMMUNICATIONS".
    - b. Non-gasketed bolt down with stainless steel penta head bolts.
    - c. Lay-in non-bolt down, when cover is over 100 LBS.
    - d. One or multiple sections so the maximum weight of a section is 125 LBS.
  - 6. Cover lifting hook: 24 IN minimum in length.
- B. Precast Manholes and Handholes:
  - 1. Fiberglass reinforced polymer concrete or steel reinforced cement concrete structures:
  - 2. AASHTO live load rating: H-20 for full deliberate vehicle traffic.
  - 3. Mating edges: Tongue and groove type.
  - 4. Solid bottom with 12 IN DIA french drain in the bottom of each manhole.
  - 5. Cable pulling eyes opposite all conduit entrances.
    - a. Coordinate exact location with installation contractor.

### **2.3 CONCRETE MANHOLE AND HANDHOLE ACCESSORIES**

- A. Cover and Frame:
  - 1. Cast ductile iron: ASTM A536.
  - 2. AASHTO live load rating: H-20.
  - 3. Diameter: 30 IN.
  - 4. Cast the legend "ELECTRICAL" or "COMMUNICATIONS" into manhole and handhole covers.



- B. Cable Racks and Hooks:
  - 1. Material: Heavy-duty nonmetallic (glass reinforced nylon).
  - 2. Hook loading capacity: 400 LBS minimum.
  - 3. Rack loading capacity: Four hooks maximum.
  - 4. Hook deflection: 0.25 IN maximum.
  - 5. Hooks: Length, as required, with positive locking device to prevent upward movement.
  - 6. Mounding hardware: Stainless steel.
- C. Cable Pulling Irons:
  - 1. 7/8 IN DIA hot-dipped galvanized steel.
  - 2. 6000 LB minimum pulling load.
- D. Ground Rods and Grounding Equipment: See Specification Section 26 05 26.

## **2.4 UNDERGROUND CONDUIT AND ACCESSORIES**

- A. Concrete and reinforcing steel: See Division 03 Specifications.
- B. Conduit: See Specification Section 26 05 33.
- C. Duct Spacers/Supports:
  - 1. High density polyethylene or high impact polystyrene.
  - 2. Interlocking web or mesh design.
  - 3. Provide 3 IN minimum spacing between conduits.
  - 4. Accessories, as required:
    - a. Hold down bars.
    - b. Ductbank strapping.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Drawings indicate the intended location of manholes and handholes and routing of ductbanks and direct buried conduit.
  - 1. Field conditions may affect actual routing.
- B. Manhole and Handhole Locations:
  - 1. Approximately where shown on the Drawings.
  - 2. As required for pulling distances.
  - 3. As required to keep pulling tensions under allowable cable tensions.
  - 4. As required for number of bends in ductbank routing.
  - 5. Shall not be installed in a swale or ditch.
  - 6. Determine the exact locations after careful consideration has been given to the location of other utilities, grading, and paving.
  - 7. Locations are to be approved by the Engineer prior to excavation and placement or construction of manholes and handholes.
- C. Install products in accordance with manufacturer's instructions.
- D. Install manholes and handholes in conduit runs where indicated or as required to facilitate pulling of wires or making connections.
- E. Comply with Specification Section 31 23 33 for trenching, backfilling and compacting.

### **3.2 MANHOLES AND HANDHOLES**

- A. Prefabricated Composite Material Handholes:
  - 1. For use in areas subjected to occasional non-deliberate vehicular traffic.
  - 2. Place handhole on a foundation of compacted 1/4 to 1/2 IN crushed rock or gravel a minimum of 8 IN thick and 6 IN larger than handholes footprint on all sides.

3. Provide concrete encasement ring around handhole per manufacturers installation instructions (minimum of 10 IN wide x 12 IN deep).
  4. Install so that the surrounding grade is 1 IN lower than the top of the handhole.
  5. Size: As indicated on the Drawings or as required for the number and size of conduits.
  6. Provide cable rails and pulling eyes as needed.
- B. Precast Manholes and Handholes:
1. For use in vehicular and non-vehicular traffic areas.
  2. Construction:
    - a. Grout or seal all joints, per manufacturer's instructions.
    - b. Support cables on walls by cable racks:
      - 1) Provide a minimum of two racks, install symmetrically on each wall of manholes and handholes.
        - a) Provide additional cable racks, as required, so that both ends of cable splices will be supported horizontally.
      - 2) Equip cable racks with adjustable hooks: Quantity of cable hooks as required by the number of conductors to be supported.
    - c. In each manhole and handhole, drive 3/4 IN x 10 FT long copper clad ground rod into the earth with approximately 6 IN exposed above finished floor.
      - 1) Drill opening in floor for ground rod.
      - 2) Connect all metallic components to ground rod by means of #8 AWG minimum copper wire and approved grounding clamps.
      - 3) Utilize a ground bar in the manhole or handhole if the quantity of ground wires exceeds three.
        - a) Connect ground bar to ground rod with a #2/0 AWG minimum copper wire.
  3. Place manhole or handhole on a foundation of compacted 1/4 to 1/2 IN crushed rock or gravel a minimum of 8 IN thick and 6 IN larger than manholes or handholes footprint on all sides.
  4. Install so that the top of cover is 1 IN above finished grade.
    - a. Where existing grades are higher than finished grades, install sufficient number of courses of curved segmented concrete block between top of handhole and manhole frame to temporarily elevate manhole cover to existing grade level.
  5. After installation is complete, backfill and compact soil around manholes and handholes.
  6. Handhole size:
    - a. As indicated on the Drawings or as required for the number and size of conduits entering or as indicated on the Drawings.
    - b. Minimum floor dimension of 4 FT x 4 FT and minimum depth of 4 FT.
  7. Manhole size:
    - a. As indicated on the Drawings or as required for the number and size of conduits entering or as indicated on the Drawings.
    - b. Minimum floor dimension of 6 FT x 6 FT and a minimum depth of 6 FT.

### 3.3 UNDERGROUND CONDUITS

- A. General Installation Requirements:
1. Concrete ductbanks shall be red dyed. Refer to Section 03 09 00 for concrete related details.
  2. Ductbank types per location:
    - a. Reinforced concrete ductbank:
      - 1) Under aircraft pavement.
      - 2) Under railroads.
      - 3) As indicated in the Drawings.
    - b. Concrete encased ductbank:
      - 1) Under roads.
      - 2) Conduits containing medium voltage cables.
      - 3) Pad mounted transformer secondaries.
      - 4) Plant process equipment feeders and controls.
      - 5) As indicated in the Drawings.

3. Do not place concrete or soil until conduits have been observed by the Engineer.
4. Ductbanks shall be sloped a minimum of 4 IN per 100 FT or as detailed on the Drawings.
  - a. Low points shall be at manholes or handholes.
5. During construction and after conduit installation is complete, plug the ends of all conduits.
6. Provide conduit supports and spacers.
  - a. Place supports and spacers for rigid nonmetallic conduit on maximum centers as indicated for the following trade sizes:
    - 1) 1 IN and less: 3 FT.
    - 2) 1-1/4 to 3 IN: 5 FT.
    - 3) 3-1/2 to 6 IN: 7 FT.
  - b. Place supports and spacers for rigid steel conduit on maximum centers as indicated for the following trade sizes:
    - 1) 1 IN and less: 10 FT.
    - 2) 1-1/4 to 2-1/2 IN: 14 FT.
    - 3) 3 IN and larger: 20 FT.
  - c. Securely anchor conduits to supports and spacers to prevent movement during placement of concrete or soil.
7. Stagger conduit joints at intervals of 6 IN vertically.
8. Make conduit joints watertight and in accordance with manufacturer's recommendations.
9. Accomplish underground changes in direction of runs exceeding a total of 15 DEG by long sweep bends having a minimum radius of 10 FT.
  - a. Sweep bends may be made up of one or more curved or straight sections or combinations thereof.
10. Furnish manufactured elbows at end of runs as the conduit transitions to above grade.
  - a. Minimum radius of 18 IN for conduits less than 3 IN trade size and 36 IN for conduits 3 IN trade size and larger.
11. Field cuts requiring tapers shall be made with the proper tools and shall match factory tapers.
12. After the conduit run has been completed:
  - a. Prove joint integrity and test for out-of-round duct by pulling a test mandrel through each conduit.
    - 1) Test mandrel:
      - a) Length: Not less than 12 IN.
      - b) Diameter: Approximately 1/4 IN less than the inside diameter of the conduit.
  - b. Clean the conduit by pulling a heavy duty wire brush mandrel followed by a rubber duct swab through each conduit.
13. Pneumatic rodding may be used to draw in lead wire.
  - a. Install a heavy nylon cord free of kinks and splices in all unused new ducts.
  - b. Extend cord 3 FT beyond ends of conduit.
14. Transition from rigid nonmetallic conduit to rigid metallic conduit, per Specification Section 26 05 33, prior to entering a structure or going above ground.
  - a. Except rigid nonmetallic conduit may be extended directly to manholes, handholes, pad mounted transformer boxes and other exterior pad mounted electrical equipment where the conduit is concealed within the enclosure.
  - b. Terminate rigid PVC conduits with end bells.
  - c. Terminate steel conduits with insulated bushings.
15. Place warning tape in trench directly over ductbanks, direct-buried conduit, and direct-buried wire and cable in accordance with Specification Section 10 14 00.
16. Placement of conduits stubbing into handholes and manholes shall be located to allow for proper bending radiuses of the cables.

**B. Concrete Encased Ductbank:**

1. Ductbank system consists of conduits completely encased in minimum 2 IN of concrete and with separations between different cabling types as required in Specification Section 26 05 33 or as detailed on the Drawings.
2. Install so that top of concrete encased duct, at any point:

- a. Is not less than 24IN below grade.
- b. Is below pavement sub-grading.
- 3. Where identified and for a distance 10 FT either side of the area, the concrete shall be reinforced.
  - a. The reinforcement shall consist of #4 bars and #4 ties placed 12 IN on center, in accordance with Division 03 Specification Sections or as detailed on the Drawings.
  - b. Conduit supports to be staggered to minimize weak vertical shear point.
- 4. Conduit supports shall provide a uniform minimum clearance of 3 IN between the bottom of the trench and the bottom row of conduit.
- 5. Conduit separators shall provide a uniform minimum clearance of 3 IN between conduits or as required in Specification Section 26 05 33 for different cabling types.

**END OF SECTION**

**SECTION 26 05 73**  
**ELECTRICAL POWER SYSTEM STUDY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Contractor shall be responsible to obtain information on existing electrical equipment and existing electrical power system studies if available. Field work will be required to verify actual installation from point of Pacific Gas And Electric (PG&E) connection to the first pieces of new electrical equipment connected to the existing electrical system.
- B. Contractor shall be responsible for the activities required to perform all analyses including, but not limited to: data collection, system modeling, and model verification, using industry approved modeling software (ETAP, SKM).
- C. Analysis shall include Protective device coordination study, Short Circuit study, Fault and Device Duty evaluation, Load Flow study, Transient Motor Starting (TMS) Study and Arc Flash Hazard Assessment. Project deliverables shall include a detailed report of the findings and recommendations.
- D. Contractor will adjust all relays and adjustable trip circuit breakers to settings determined by the Power system study.
- E. Contractor shall provide and attach new Arc Flash labels to new and existing electrical equipment as required by National Fire Protection Agency (NFPA) 70E.

**1.2 SUBMITTALS**

- A. Completed electrical power system studies shall be bound and submitted to Engineer.
- B. Contractor is responsible for completing an electrical power system study. Contractor shall provide a table containing the settings of all relays and adjustable trip circuit breakers. rated over 100A.
- C. Contractor shall perform an electrical power system study to determine the final settings of the relays and adjustable trip circuit breakers over 100A per the final "As-Built" installation. The study shall be included in the switchgear O&M manual. This submittal will contain the following:
  - 1. Complete input data report, including computer generated protected device settings report.
  - 2. Load Flow Study.
  - 3. Load Flow, Short Circuit and Arc Flash analyzer reports in MS Excel format.
  - 4. Short Circuit and Arc Flash result analyzer reports shall indicate worst case scenario conditions and associated results.
  - 5. Coordination Study Report including computer generated Time-current Characteristic Curves (TCC).
  - 6. Arc Flash Hazard Assessment Report and Personal Protective Equipment Label.
  - 7. Electronic copy of computer software (project) model including update to existing model if available.

**1.3 REFERENCES**

- A. American National Standards Institute (ANSI)
  - 1. ANSI C57.12.01 – Standard General Requirements for Dry-Type Distribution, Power Transformers
  - 2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
  - 3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis

4. ANSI C37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories
- B. Institute of Electrical and Electronics Engineers (IEEE):
  1. IEEE C2 National Electric Safety Code
  2. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems (Red Book)
  3. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
  4. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).
  5. IEEE 315 - Standards Electrical and Electronics Graphic and Letter Symbols and Reference Designations.
  6. IEEE 399 Recommended Practice for Industrial and Commercial Power Systems Analysis (Brown Book).
  7. 902 - IEEE Guide for Maintenance, Operation and Safety on Industrial and Commercial Power Systems (Yellow Book).
  8. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems - Corrigendum 1 (Blue Book).
  9. 7. IEEE 1584– Guide for Performing Arc Flash Hazard Calculations
- C. National Fire and Protection Association (NFPA):
  1. NFPA 70 – National Electrical Code (NEC)
  2. NFPA 70E – Standard for Electrical Safety in the Workplace

#### **1.4 SYSTEM DESCRIPTION**

- A. General study requirements:
  1. Scope:
    - a. The load flow, transient motor starting, short-circuit fault analysis, protective device coordination and arc-flash hazard studies shall include all equipment in the power distribution system including but not limited to:
      - 1) Utility equipment.
      - 2) Switchboards.
      - 3) Generators.
      - 4) Transformers:
        - a) Including all dry-type transformers.
      - 5) Motor Control Centers.
      - 6) Reduced Voltage Soft Starters.
      - 7) Disconnect Switches.
      - 8) Motors.
      - 9) Panelboards: Including all 240 and 208 volt systems
      - 10) Vendor Control Panels.
      - 11) HVAC Equipment.
    - b. Study Scenarios:
      - 1) The studies shall include all possible electrical system configurations, for example:
        - a) Operation on normal (utility) source.
        - b) Operation on generator source.
  2. Obtain, for all equipment, the required data for preparation of the study, including, but not limited to:
    - a. Transformer kilovolt-ampere and impedances.
    - b. Generator impedances.
    - c. Generator decrement curves.
    - d. Bus withstand ratings.
    - e. Cable and bus data.
    - f. Protective device taps, time dials, instantaneous pickups, and time delay settings.

3. Obtain the Electric Utility information on the minimum and maximum available fault current, minimum and maximum utility impedances, utility protective device settings including manufacturer and model number, interrupting ratings, X/R ratios, and model information one level above the point of connection:
    - a. Utility tolerances and voltage variations.
  4. The individual performing the studies shall visit the site and collect all necessary field data in order to perform and complete comprehensive electrical system studies.
    - a. Coordinate with client to obtain prior system coordination and arc flash studies.
  5. Obtain equipment layouts and configurations from the manufacturer's final submittal requirements and Contract Drawings as required.
  6. Bus and conductor data:
    - a. Use impedances of the actual installed or specified conductors, unless otherwise indicated.
    - b. Use cable and bus impedances calculated at 25 degrees Celsius, unless otherwise indicated.
    - c. Use 600-volt cable reactance based on typical dimensions of actual installed or specified conductors, unless otherwise indicated.
    - d. Use bus withstand values for all equipment having buses.
    - e. Use medium voltage cable reactances based on typical dimensions of shielded cables with 133 percent insulation levels, unless otherwise indicated.
  7. Motors:
    - a. Each motor shall be individually modeled:
      - 1) Grouping of motors for fault contribution current is not acceptable.
    - b. Motors with variable frequency drives may be assumed to have no contribution to fault current.
  8. Use the equipment, bus, and device designations as indicated on the Drawings for all studies.
- B. Short-circuit fault analysis study additional requirements:
1. The short-circuit fault analysis shall be performed and submitted in 2 phases:
    - a. Initial short-circuit fault analysis:
      - 1) Based on the Contract Documents and Electric Utility information.
      - 2) The initial short-circuit fault analysis report shall indicate the estimated available short-circuit current at the line side terminals of each piece of equipment covered by the scope of the study.
      - 3) Provide a list of assumptions used in the initial study.
    - b. Final short-circuit analysis:
      - 1) The final short-circuit fault analysis shall modify the initial analysis as follows:
        - a) Utilize the actual equipment provided on the project.
        - b) Utilize conductor lengths based on installation.
  2. Calculate 3-phase bolted fault, line-to-line fault, and line-to-ground fault short circuit current values at each piece of equipment in the distribution system.
  3. Evaluate bus bracing, short circuit ratings, fuse interrupting capacity and circuit breaker adjusted interrupting capacities against the fault currents, and calculate X/R values:
    - a. Identify and document all devices and equipment as either inadequate or acceptable.
  4. Calculate line-to-ground momentary short circuit values at all buses having ground fault devices.
  5. Provide calculation methods, assumptions, one-line diagrams, and source impedance data, including Utility X/R ratios, typical values, recommendations, and areas of concern.
- C. Protective device coordination study additional requirements:
1. Furnish protective device settings for all functions indicated on the Drawings, including, but not limited to:
    - a. Current.
    - b. Voltage:
      - 1) Provide settings for all voltage relays based upon actual Utility and generator tolerances and specifications.

- c. Frequency:
    - 1) Provide settings for all frequency relays based upon actual Utility and generator tolerances and specifications.
  - d. Machine protection functions:
    - 1) Provide settings for all motor and generator protective relays based on the manufacturer's recommended protection requirements.
  - 2. Provide log-log form time-current curves (TCCs) graphically indicating the coordination proposed for the system:
    - a. Include with each TCC a complete title and one-line diagram with legend identifying the specific portion of the system covered by the particular TCC:
      - 1) Typical time-current curves for identical portions of the system, such as motor circuits, are acceptable as allowed by the ENGINEER.
    - b. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics:
      - 1) These details can be included on the TCC.
    - c. Include a detailed description of each protective device tap, time dial, pickup, instantaneous, and time delay settings:
      - 1) These details can be included in the TCC.
  - 3. TCCs shall include all equipment in the power distribution system where required to demonstrate coordination. Include Utility relay and fuse characteristics, medium voltage equipment protective relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, transformer characteristics, motor and generator characteristics, and characteristics of other system load protective devices:
    - a. Include all devices down to the largest branch circuit and largest feeder circuit breaker in each motor control center, main breaker in branch panelboards and fused disconnect switches.
    - b. Provide ground fault TCCs with all adjustable settings for ground fault protective devices.
    - c. Include manufacturing tolerances and damage bands in plotted fuse and circuit breaker characteristics.
    - d. On the TCCs show transformer full load currents, transformer magnetizing inrush, ANSI transformer withstand parameters and transformer damage curves.
    - e. Cable damage curves.
    - f. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed based on the short-circuit fault analysis study.
    - g. Coordinate time interval medium-voltage relay characteristics with upstream and downstream device to avoid nuisance tripping.
  - 4. Suggest modifications or additions to equipment rating or settings in a tabulated form.
- D. Arc-Flash Hazard Study Additional Requirements:
- 1. Include the calculated arc-flash boundary and incident energy (calories/square centimeter) at each piece of equipment in the distribution system:
    - a. Perform Arc-flash calculations for both the line side and load side of switchgear, switchboard, motor control center, and panelboard main breakers.
    - b. Perform arc-flash calculations for all short-circuit scenarios with all motors on for 3 to 5 cycles and with all motors off.
    - c. Protective device clearing time shall be limited to 2 seconds, maximum.
  - 2. Provide executive summary of the study results.
  - 3. Provide a detailed written discussion and explanation of the tabulated outputs.
  - 4. Provide alternative device settings to allow the Engineer to select the desired functionality of the system:
    - a. Minimize the arc-flash energy by selective trip and time settings for equipment maintenance purposes.
    - b. Identify the arc-flash energy based upon the criteria of maintaining coordination and selectivity of the protective devices.



5. Perform the arc flash study calculations using both IEEE 1584 and NFPA 70E. Provide both studies in the final report. Provide summary based upon worst case results between IEEE 1584 and NFPA 70E.
- E. Electrical system study meetings:
1. The individual conducting the load flow, transient motor starting, short circuit analysis, protective device coordination, and the arc-flash hazard studies shall meet with the Engineer 3 times.
  2. The purpose of the 3 meetings is as follows:
    - a. Initial meeting:
      - 1) Meet with the Engineer to discuss the scope of the studies.
      - 2) Discuss the Engineer's operational requirements for both normal operation and maintenance.
    - b. Preliminary results meeting:
      - 1) This meeting will be held after the studies have been completed, reviewed, and accepted by the Engineer.
      - 2) The purpose of this meeting is to inform the Engineer of the results of the study and impacts on normal operation and maintenance including:
        - a) Load flow results and its potential impact on operations.
        - b) Transient Motor Starting results and recommended solutions for optimal timing.
        - c) Protective device coordination problems and recommended solutions.
        - d) Explanation of the arc-flash study results and its potential impact on operations.
        - e) Recommendations for reduction of arc-flash category levels including reduction of protective device settings or changes in operational practices.
    - c. Final meeting:
      - 1) Discuss changes to the reports based on the previous meeting.
      - 2) Discuss with the Engineer how changes to the electrical system may change the arc-flash hazard category.
      - 3) Deliver the final electrical system studies report.
  3. The meetings will be at the client's facility:
    - a. Provide a minimum of 3 weeks notice to the client in advance of the projected meeting date.
    - b. Submit a draft of the meeting agenda when each meeting is requested.
  4. Meeting materials:
    - a. Prepare and provide the following materials:
      - 1) Meeting agenda. Include at a minimum the scope of the meeting, estimated time length for the meeting and meeting goals.
      - 2) Six copies of the project one-line diagrams for the initial meeting.
      - 3) Six copies of the studies of the submitted study.
- F. By virtue of the fact that this is a professional study, the Engineer reserves the right to modify the requirements of the study to comply with its operational requirements. The protective device coordination study and the arc-flash study shall be modified based on the results of the meetings with the Engineer.

## 1.5 SUBMITTALS

- A. Furnish submittals in accordance with Special Provision 19.
- B. Initial Studies and Reports:
  1. Include the following in the initial short circuit current report:
    - a. List of all devices included in the studies.
    - b. A description of all operating scenarios.
    - c. Form and format of arc flash labels.
- C. Final Studies and Reports:
  1. Format and Quantity:

- a. Provide 6 bound copies of all final reports.
- b. Provide 3 complete sets of electronic files on CD or DVD media, including the electrical system model(s), configuration files, custom libraries, and any other files used to perform the studies and produce the reports. Also provide an electronic version of the bound reports in PDF format.
2. Include the sections below in the final report:
  - a. Copies of correspondence and data obtained from the Electric Utility Company.
  - b. Letter certifying the inspection and verification of existing equipment.
  - c. One-line diagrams:
    - 1) The following information shall be included at a minimum:
      - a) Motor horsepower.
      - b) Transformer data:
        - (1) KVA
        - (2) Configuration
      - c) Cable Data:
        - (1) Insulation.
        - (2) Size.
        - (3) Length.
    - 2) One-line diagrams shall be fully legible at 11-inch by 17-inch size.
  - d. Include in the load flow study:
    - 1) Descriptions, purpose, basis, assumptions, recommendations, and scope of the study.
    - 2) Modeling of utility and generator equivalent impedance calculated from short circuit duty.
    - 3) Modeling of motor and non-motor loads.
    - 4) Reporting of bus voltage, voltage angle, and voltage drop at each bus, and branch voltage drop, branch loss, and total system losses.
  - e. Include in the transient motor starting study:
    - 1) Descriptions, purpose, basis, assumptions, recommendations, and scope of the study.
    - 2) Simulation of all pump motor scenarios dynamically modeled throughout starting, stopping or reacting to load changes. Simulations to be run from utility and generator power.
    - 3) Voltage dip impact on motor starting and motor accelerating times.
    - 4) Evaluation of interaction between multiple motors during starting conditions, motor starting heating problems, application of reduced voltage starters.
    - 5) Optimal timing of staggered motor starting and re acceleration schemes.
    - 6) Time related output data including bus voltage, motor speed, motor slip, motor torque, load torque, accelerating torque, stator voltage, stator current, input power, VARs, power factor, and rotor current.
  - f. Include in the short-circuit fault analysis study:
    - 1) Descriptions, purpose, basis, assumptions, recommendations, and scope of the study.
    - 2) Normal system connections and those, which result in maximum fault conditions.
    - 3) Tabulation of circuit breaker, fuse, and other protective device ratings compared to maximum calculated short circuit duties.
    - 4) Fault current calculations for the cases run including a definition of terms and guide for interpretation of computer software printouts.
  - g. Protective device coordination study shall include:
    - 1) Descriptions, purpose, basis, assumptions, recommendations, and scope of the study.
    - 2) List all requirements used in the selection and setting criteria for any protective devices.
    - 3) Manufacturer's time-current curves for circuit breakers, fuses, motor circuit protectors, and other protective devices for all new equipment.

- 4) Time-current curves (TCCs) graphically indicating the coordination proposed for the system on log-log graphs. At least 3 of the copies shall be in color.
  - 5) Tabulation of relay, fuse, circuit breaker, and other protective devices in graphical form with a one-line diagram to display area coordination.
  - 6) Where coordination could not be achieved, an explanation shall be included in the report to support the statement along with recommendations to improve coordination. Recommended equipment modifications or settings shall be in a tabulated form.
- h. Include in the arc-flash study:
- 1) Descriptions, purpose, basis, assumptions, recommendations, and scope of the study.
  - 2) Normal system connections and those, which result in maximum arc-flash conditions.
  - 3) Arc-flash raw data, calculations, and assumptions.
  - 4) Arc-flash label data:
    - a) Identifying the content of each label.
    - b) Identifying the location of each label.
- D. Certification:
1. Submit written certification, sealed, and signed by the professional engineer conducting the study, equipment supplier, and electrical subcontractor stating that the data used in the study is correct.
- E. Submit the credentials of the individual(s) performing the study and the individual in responsible charge of the study.
- F. The Engineer will review all studies and reports. After review, the Engineer will make recommendations and/or require changes to be made to the short-circuit analysis, protective device coordination or arc-flash studies. These changes shall be provided as part of the scope of work.

## 1.6 QUALITY ASSURANCE

- A. Refer to Section and 01 61 03.
- B. Qualifications of the entity responsible for electrical system studies:
1. The studies shall be performed, stamped, and signed by a Professional Engineer registered in the state where the project is located.
  2. A minimum of 5 years' experience in power system analysis is required for the individual in responsible charge of the studies.
  3. The short-circuit analysis, protective device coordination, and arc-flash hazard studies shall be performed with the aid of a digital computer program:
    - a. Point-to-point calculations are not acceptable.
- C. The study shall be performed by an independent firm.

## 1.7 SEQUENCING

- A. Site visit to gather data on the existing facility systems for all studies:
1. Make multiple trips as required to obtain all data for the short-circuit, protection device coordination and arc flash study.
- B. Submit the initial short-circuit analysis study before submittal of any electrical equipment.
- C. Submit the final short-circuit analysis and protective device coordination studies.
- D. Initial arc-flash meeting.
- E. Submit the arc-flash hazard study.
- F. Second arc-flash meeting for preliminary results.
- G. Final arc-flash meeting and final reports.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Electrical system study software:
  - 1. Powertools by SKM Systems Analysis, or approved equal.

### **2.2 COMPONENTS**

- A. Arc-Flash Hazard Labels:
  - 1. Dimensions:
    - a. Minimum 5 inches by 3.5 inches.
  - 2. Materials:
    - a. Polyester with polyvinyl polymer over-laminate.
    - b. Self-adhesive.
    - c. Resistant to:
      - 1) UV.
      - 2) Chemicals and common cleaning solvent resistant.
      - 3) Scuffing.
      - 4) Wide temperature changes.
  - 3. Contents:
    - a. Short-circuit bus identification.
    - b. Calculated incident energy (calories/square centimeter) range.
    - c. Arc-flash protection boundary.
    - d. Shock Hazard Boundary:
      - 1) The Contactor may provide separate labels for indication of the shock hazard boundary.
  - 4. Color Scheme:
    - a. For locations above 40 calories/square centimeter:
      - 1) White label with red "DANGER" strip across the top.
      - 2) Black lettering.
    - b. For locations below 40 calories/square centimeter:
      - 1) White label with orange "WARNING" strip across the top.
      - 2) Black lettering.

### **2.3 SITE VISIT**

- A. Review safety procedures, and facility conditions prior to site visit.
- B. Request available short circuit current and X/R ratio from Pacific Gas and Electric (PG&E) at PG&E point of connection. Indicate available short circuit at all substations and switchboards between the PG&E point of connection and the last piece of equipment which shall require Arc Flash label. Record the settings of all relays and adjustable trip circuit breakers 100A or above between PG&E feed point and the last piece of equipment requiring Arc Flash label. Incorporate the recorded information in all electrical system studies.
- C. If the above data is not available state the reason that the information could not be located and the method used to determine the assumed settings.

## **PART 3 - EXECUTION**

### **3.1 ELECTRICAL POWER SYSTEM STUDIES**

- A. A one line diagram shall be provided with all equipment and material that is part of the electrical system studies. The device numbers and names shall match those shown on the existing 'As-Built' Drawings or Contract Drawings for new equipment. The following data shall be collected for the study.

1. Product Data for overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
  - a. Circuit-breaker and fuse-current ratings and types.
  - b. Generator kilovolt amperes, size, voltage, and source impedance
  - c. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
  - d. Motor horsepower and code letter designation according to NEMA MG 1.
3. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
  - a. Special load considerations such as cranes, including starting inrush currents, regeneration and frequent starting and stopping
  - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability
  - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
  - d. Ratings, types, and settings of utility company's overcurrent protective device
  - e. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers
  - f. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays
  - g. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical

### 3.2 SHORT CIRCUIT STUDY

- A. Short circuit study will be performed to ensure that all electrical equipment and protective devices can withstand the maximum available short circuit current.
  1. Calculate the maximum available short circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit. Calculate momentary and interrupting duties on the basis of maximum available fault current at each of the following:
    - a. Switchgear, switchboard, busways, bus duct, motor control centers, unit substations, transformers, panelboards, automatic transfer switches and other significant locations throughout the system.
  2. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions
  3. Protective Device Time-Current Coordination Analysis
    - a. The time-current coordination analysis shall be performed with the aid of computer software program, SKM or equal, and will include the determination of settings, ratings, or types for the overcurrent protective devices supplied.
    - b. A sufficient number of computer generated Time-current Characteristic Curves (TCC) log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of connected overcurrent devices and other pertinent system parameters.
    - c. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, the short-circuit current availability at the device location and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.

- d. When equipment is directly connected to Pacific Gas and Electric (PG&E), Contractor shall work with PG&E and ensure that all relay settings or adjustable trip breaker coordinate with PG&E.
  - e. The study shall include a separate, table containing the suggested device setting of all relays and adjustable overcurrent protective devices; indicate the equipment where the device is located, and the device number corresponding to the device on the system one-line diagram.
  - f. A computer generated system one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus. These identifications must be in accordance with Contract Documents and identical to what is shown in Contract Documents.
  - g. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
4. Significant deficiencies in protection and/or coordination shall be called to the attention of the Engineer and recommendations made for improvements as soon as they are identified.

### **3.3 LOAD FLOW STUDY**

- A. Load flow study shall be performed to evaluate the system's capability to adequately supply the connected load and prevent overloading of equipment.
- B. Compare equipment (transformers, cables, breakers, fuses) operating values against manufacturer's specified maximum capability ratings whenever available.
- C. Provide a computer generated Alert View list/report which lists all equipment that is overloaded
- D. Voltage drop calculations shall be performed on all circuits to determine the worst case voltage drop. Feeder voltage drop shall be limited to 3% and combined feeder and branch circuit shall be less than 5%. The voltage drop results shall be shown individually on the single line diagram
- E. Provide a computer generated load flow analysis report that provides a summarized comparison of power flow results between the different scenarios being evaluated.

### **3.4 ARC FLASH HAZZARD ANALYSIS**

- A. All requirements shall be from the latest edition of the referenced code or standard. Arc Flash warning labels shall be provided on all electrical equipment as required by the NEC, IEEE-1584, IEEE C2 and NFPA 70E. In case of any conflict the more stringent requirement shall be used.
  - 1. The Arc Flash Hazard Analysis shall be performed with the aid of a digital computer in order to calculate Arc Flash Incident Energy (AFIE) levels and arc flash protection boundary distances.
  - 2. The Arc Flash Hazard Analysis shall be performed in conjunction with a short-circuit analysis and a time-current coordination analysis.
  - 3. Results of the Arc Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
  - 4. The Arc Flash Hazard Analysis shall be performed by a registered professional electrical engineer.
  - 5. The Arc Flash Hazard Analysis shall be performed in compliance with IEEE Standard 1584, the IEEE Guide for Performing Arc Flash Calculations.
  - 6. The Arc Flash Hazard Analysis shall include recommendations for reducing AFIE levels and enhancing worker safety.
  - 7. The Arc Flash Hazard Analysis shall report incident energy values based on the existing incident energy values at all buses within the scope of the study in addition to incident energy values based on the recommended overcurrent device setting changes.

- B. Calculations shall be performed to determine the following and all calculations must be submitted for each piece of equipment. The minimum information required in an Arc Flash hazard protection analysis are:
1. HAZARD RISK CATEGORY (HRC): A general classification of hazard involved in performing specified tasks. Typically ranges from 0 to 4. The NFPA provides a recommended list of PPE for each HRC in table 130.7 of NFPA 70E.
  2. INCIDENT ENERGY (cal/cm<sup>2</sup>) at 18 inches: This is the energy per unit area for a potential arc flash 18 inches from the source of the arc.
  3. ARC FLASH BOUNDARY: This is the distance from the arc flash source for which a person is likely to receive a second degree burn. Second degree burns typically occur at an energy level of 1.2 cal/cm<sup>2</sup>
  4. SHOCK HAZARD PROTECTION INFORMATION: The minimum information required in a Shock Hazard protection analysis are:
    - a. Limited Approach Boundary: This boundary may only be crossed by a qualified person, or an unqualified person wearing appropriate PPE and accompanied by a qualified person.
    - b. Restricted Approach Boundary: This boundary may only be crossed by authorized management using adequate shock prevention equipment and techniques.
    - c. Prohibited Approach Boundary: This boundary may only be crossed by a qualified person that has the same level of protection required for direct contact with live parts.
    - d. A Copy of the calculations and label shall be submitted for Arc Flash Labels
    - e. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations to lower available Arc Fault currents.

## EXAMPLE OF LABEL TO BE USED

(3.5 inch x 5 inch thermal transfer type label of high adhesion polyester)

 <b>WARNING</b>	
<b>ARC FLASH &amp; SHOCK HAZARD APPROPRIATE PPE REQUIRED</b>	
<b>ARC FLASH PROTECTION</b>	<b>SHOCK PROTECTION</b>
Arc Flash Hazard Category	1
Incident Energy	2.7 (cal/cm <sup>2</sup> )
@ Working Distance	36 inches
Arc Flash Boundary	82 inches
Voltage Shock Hazard	4160 VAC
Limited Approach Boundary	60 inches
Restricted Approach Boundary	26 inches
Prohibited Approach Boundary	7 inches
Glove Class	1

Equipment ID: Created on EasyMark      Date: 1/1/2012      By: Panduit



Example of information provided in the final analysis.

	<b>BUS NAME</b>		
	<b>100 T-920A</b>	<b>101 PNL PCA</b>	<b>102 TD-304</b>
<b>Protective Device Name</b>	004 Dual	101 PCA Main	101 PCA - 10
<b>KV</b>	0.48	0.48	0.48
<b>Bus Bolted Fault (kA)</b>	14.81	14031	7.51
<b>Protective Device Bolted Fault (kA)</b>	13.65	13.15	7.51
<b>Arcing Fault (kA)</b>	8.45	8.19	5.14
<b>Time / Delay Trip (sec)</b>	1.451	0.04	0.0017
<b>Breaker Opening Time (sec)</b>	0	0	0
<b>GND</b>	Yes	Yes	Yes
<b>Equipment Type</b>	Panel	Panel	Panel
<b>GAP (mm)</b>	25	25	25
<b>Arc Flash Boundary (in)</b>	145	18	7
<b>Working Distance (in)</b>	18	18	18
<b>Incident Energy (cal/cm<sup>2</sup>)</b>	36.8	1.17	0.27
<b>Hazard / Risk Category Number</b>	4	0	0

### **3.5 FINAL REQUIREMENTS**

- A. The final Study performed by the Contractor shall be generated based on the final electrical equipment submittals and final pulled conductor lengths.
- B. Based on the findings of the final report the Contractor shall have a third party Contractor set the relays and circuit breakers prior to final acceptance and functional testing.
- C. The Final Report will be reviewed by, signed and stamped by a registered professional Electrical Engineer.

**END OF SECTION**

**SECTION 26 08 13**  
**ACCEPTANCE TESTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Basic requirements for acceptance testing.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 01 61 03 - Equipment - Basic Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. InterNational Electrical Testing Association (NETA):
    - a. ATS, Standard for Acceptance Testing Specifications for Electric Power Equipment and Systems.
  - 2. Nationally Recognized Testing Laboratory (NRTL).
  - 3. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
    - a. 455-78-B, Optical Fibres - PART 1-40: Measurement Methods and Test Procedures - Attenuation.
- B. Qualifications:
  - 1. Testing firm qualifications: See Specification Section 01 61 03.
  - 2. Field personnel:
    - a. See Specification Section 01 61 03.
    - b. As an alternative, supervising technician may be certified by the equipment manufacturer.
  - 3. Analysis personnel:
    - a. See Specification Section 01 61 03  
As an alternative, supervising technician may be certified by the equipment manufacturer.
- C. Phasing Diagram:
  - 1. Coordinate with Utility Company for phase rotations and Phase A, B and C markings.
    - a. Create a phasing diagram showing the coordinated phase rotations with generators and motors through the transformers.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. See Specification Section 01 61 03 for electrical equipment and connection testing plan submittal requirements.
- B. Informational Submittals:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Prior to energizing equipment:
    - a. Coordinated phasing diagram.
  - 3. Within two weeks after successful completion of Demonstration Period (Commissioning Period):

- a. Single report containing information including:
  - 1) Summary of Project.
  - 2) Information from pre-energization testing.
  - 3) See testing and monitoring reporting requirements in Specification Section 01 61 03.

## **PART 2 - PRODUCTS**

### **2.1 FACTORY QUALITY CONTROL**

- A. Provide Electrical equipment with all factory tests required by the applicable industry standards or NRTL.
- B. Factory testing will not be accepted in lieu of field acceptance testing requirements specified in this Specification Section and Specification Section 01 61 03.

## **PART 3 - EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- A. General:
  - 1. See Specification Section 01 61 03.
  - 2. Complete electrical testing in three phases:
    - a. Pre-energization testing phase.
    - b. Equipment energized with no load.
    - c. Equipment energized under load.
  - 3. Perform testing in accordance with this Specification Section and NETA ATS.
  - 4. Provide field setting and programming of all adjustable protective devices and meters.
- B. Equipment Monitoring and Testing Plan: See Specification Section 01 61 03.
- C. Instruments Used in Equipment and Connections Quality Control Testing: See Specification Section 01 61 03.
- D. Testing and Monitoring Program Documentation: See Specification Section 01 61 03.
- E. Electrical Equipment and Connections Testing Program:
  - 1. See Specification Section 01 61 03.
  - 2. See individual Division 26 Specification Sections for equipment specific testing requirements.
  - 3. Test all electrical equipment.
    - a. Perform all required NETA testing.
    - b. Perform all required NETA testing plus the optional testing identified with each specific type of equipment in Article 3.2 of this Specification Section.

### **3.2 SPECIFIC EQUIPMENT TESTING REQUIREMENTS**

- A. Cable - Low Voltage:
  - 1. Perform inspections and tests per NETA ATS 7.3.2. The tests shall be performed by a megohmmeter.
- B. Low Voltage Molded Case Circuit Breaker:
  - 1. Perform inspection and test per NETA ATS 7.6.1.1.
  - 2. Components:
    - a. Test all components per applicable paragraphs of this Specification Section and NETA ATS.
    - b. Thermal magnetic breakers: Visual and mechanical inspection per NETA ATS only.
    - c. Solid state trip type: Visual and mechanical inspection and electrical test per NETA ATS.
  - 3. Record as-left settings.

- C. Grounding:
  - 1. Perform inspections and tests per NETA ATS 7.13.
  - 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- D. Motors:
  - 1. Perform inspections and tests per NETA ATS 7.15.
  - 2. See Specification Section 01 61 03.
- E. Control System Functional Test:
  - 1. Perform test upon completion of equipment acceptance tests.
  - 2. The test is to prove the correct interaction of all sensing, processing and action devices.
  - 3. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
  - 4. Perform the following tests:
    - a. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
    - b. Verify the correct operation of all sensing devices, alarms and indicating devices.

**END OF SECTION**



**SECTION 26 09 16**  
**CONTROL EQUIPMENT ACCESSORIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Operator control devices (selector switches, pushbuttons, indicator lights, etc.).
  - 2. Control devices (timers, relays, contactors, etc.).
  - 3. Industrial Control Panels.
  - 4. Operator Control Stations.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 00 – Procurement and Contracting Requirements.
  - 2. Division 01 – General Requirements.
  - 3. Section 26 05 00 - Electrical - Basic Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. ICS 2, Industrial Control and System Controllers, Contactors and Overload Relays Rated 600 Volts.
    - c. ICS 5, Control Circuit and Pilot Devices.
  - 2. Underwriters Laboratories, Inc. (UL):
    - a. 508, Standard for Safety Industrial Control Equipment.
    - b. 508A, Standard for Industrial Control Panels.
    - c. 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.

**1.3 SYSTEM DESCRIPTION**

- A. This Specification specifies components used within other equipment as referenced in other technical specifications.
- B. This Specification is used to specify the components and construction of following Operator Control Stations:
- C. This Specification is used to specify the components and construction of following Industrial Control Panels.

**1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data:
    - a. Provide submittal data for all products specified in PART 2 of this Specification:
      - 1) When components are used within equipment specified in another Section, submittal data for components specified herein shall be included with the submittal for the equipment the components are used in.
    - b. Industrial Control Panel bill of material.
    - c. Control Station bill of material.
    - d. See Section 26 05 00 for additional requirements.
  - 3. Fabrication and/or layout drawings.
    - a. Industrial Control Panel:
      - 1) Interior and exterior layout.

- 2) Wiring/connection diagrams.
    - 3) Copy of the UL 508A label.
    - 4) Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations.
  - b. Operator Control Station:
    - 1) Interior (if applicable) and exterior layout.
    - 2) Wiring/connection diagrams.
  - c. Associate Industrial Control Panel and Operator Control Stations with associated equipment name and tagging.
- B. Informational Submittals:
- 1. Functional Test Plan.
- C. Contract Closeout Information:
- 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
    - b. Content of Operation and Maintenance Manual:
      - 1) Product technical data of components used within Industrial Control Panels and Operator Control Stations.
      - 2) As-constructed wiring/connection diagrams for Industrial Control Panels and Operator Control Stations.
      - 3) Operating instructions.
      - 4) Functional Test Report.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
- 1. Pilot devices, relays, contactors, and termination equipment:
    - a. Allen-Bradley by Rockwell Automation, Inc.
    - b. ATC Diversified Electronics by Bellofram Group of Companies.
    - c. ASCO by Emerson Electric Co.
    - d. c3controls.
    - e. Eaton.
    - f. GE/ABB.
    - g. IDEC Corporation.
    - h. Phoenix Contact.
    - i. Potter and Brumsfield (P&B) by TE Connectivity.
    - j. Schneider Electric.
    - k. Siemens Corporation.
    - l. Time Mark Corporation.
    - m. Or approved equal.
  - 2. Alarm devices:
    - a. Edwards Signaling by United Technologies Corp.
    - b. Federal Signal Corporation.
    - c. Or approved equal.
  - 3. Enclosures:
    - a. Hoffman Engineering.
    - b. Wiegmann by Hubbell.
    - c. B-Line by Eaton.
    - d. Adalet.
    - e. Stahlin by Robroy Enclosures.
    - f. Or approved equal.



## 2.2 PILOT DEVICES

- A. General Requirements:
  - 1. Standards: NEMA ICS 5, UL 508.
  - 2. Heavy-duty NEMA 4/13 watertight/oiltight.
  - 3. Heavy-duty NEMA 4/4X corrosion resistant.
  - 4. Heavy-duty factory sealed, explosion-proof and dust ignition-proof (Class I and II).
  - 5. Mounting hole: 30.5 MM.
  - 6. Contact blocks: 10 amp, NEMA A600 rated, number as required to fulfill functions shown or specified.
  - 7. Legend plate marked as indicated on Drawings or specified.
- B. Selector Switches:
  - 1. Two, three- or four-position rotary switch as required to fulfill functions shown or specified.
  - 2. Maintained contact type.
  - 3. Knob or lever type operators.
- C. Pushbuttons:
  - 1. Non-illuminated type:
    - a. Protective boot.
    - b. Momentary contact.
    - c. Standard flush and mushroom operators.
    - d. Red colored buttons for START or ON and green color for STOP or OFF.
    - e. Emergency stop pushbuttons: Mushroom head operator and maintained contact.
  - 2. Illuminating type:
    - a. Protective boot.
    - b. Momentary contact.
    - c. Standard flush operator.
    - d. Serves as both pushbutton control and indicating light.
    - e. Red colored lenses: START or ON.
    - f. Green colored lenses: STOP or OFF.
    - g. Resistor-type full voltage light unit with lens and panel gasket.
- D. Indicating Lights:
  - 1. Allowing replacement of bulb without removal from control panel.
  - 2. Lamp: LED, 120 V or 24 V as required.
  - 3. Full voltage type.
  - 4. Push-to-test indicating lights.
  - 5. Plastic lens.
  - 6. Color code lights as follows:
    - a. Red: ON or running; open.
    - b. Amber: Standby; auto mode; ready, alarm.
    - c. Green: OFF or stopped; valve closed.

## 2.3 RELAYS

- A. General Requirements:
  - 1. Standards: NEMA ICS 5, UL 508.
- B. Control Relays:
  - 1. General purpose (ice cube) type:
    - a. Plug-in housing.
    - b. Clear polycarbonate dust cover with clip fastener.
    - c. Coil voltage: 120 VAC or as required.
    - d. Contacts:
      - 1) 10 amp continuous.
      - 2) Silver cadmium oxide.
      - 3) Minimum of 3 SPDT contacts.
    - e. Sockets: DIN rail mounted.

- f. Internal neon or LED indicator is lit when coil is energized.
    - g. Manual operator switch.
  - 2. Industrial type:
    - a. Coil voltage: 120 VAC or as required.
    - b. Contacts:
      - 1) 10 amp, NEMA A600 rated.
      - 2) Double break, silver alloy.
      - 3) Convertible from normally open to normally closed or vice versa, without removing any wiring.
      - 4) Expandable from 2 poles to 12 poles.
    - c. Provide contacts for all required control plus two spares.
- C. Time Delay Relays:
  - 1. General purpose type:
    - a. Timing modes: On and Off delay, interval, one shot and repeat cycle.
    - b. Plug-in housing.
    - c. Polycarbonate dust cover with clip fastener.
    - d. Coil voltage: 120 VAC or as required.
    - e. Contacts:
      - 1) 10 amp continuous.
      - 2) Silver cadmium oxide.
      - 3) Two normally open and two normally closed DPDT contacts.
    - f. Sockets: DIN rail mounted.
    - g. External timing adjustment knob.
    - h. Timing ranges: 0.05 seconds to 16.65 HRS.
    - i. Repeat accuracy: +1%.
  - 2. Solid State industrial type:
    - a. Timing modes: On and Off delay and repeat cycle.
    - b. Industrial housing.
    - c. Coil voltage: 120 VAC or as required.
    - d. Contacts:
      - 1) 5 amp, NEMA B150 rated.
      - 2) Silver alloy.
      - 3) Convertible On Delay and Off Delay contacts.
      - 4) One normally open and one normally closed timed contacts.
      - 5) One normally open and one normally closed instantaneous contacts.
    - e. Furnish with "on" and "timing out" indicators.
    - f. External timing adjustment knob.
    - g. Timing ranges: 0.05 seconds to 10 HRS.
    - h. Repeat accuracy: +1%.
  - 3. Mechanical industrial type:
    - a. Timing modes: On and Off delay.
    - b. Coil voltage: 120 VAC or as required.
    - c. Contacts:
      - 1) 10 amp, NEMA A600 rated.
      - 2) Double break, silver alloy.
      - 3) Convertible On Delay and Off Delay contacts.
      - 4) Convertible normally open and normally closed timed contacts.
      - 5) Convertible normally open instantaneous contacts.
    - d. External timing adjustment knob.
    - e. Timing ranges: 0.2 - 60 seconds or 5 - 180 seconds.
    - f. Repeat accuracy: Greater than +10%.

## 2.4 CONTACTORS

- A. General Requirements:
  - 1. Standards: NEMA ICS 2, UL 508.

- B. Lighting and Remote Control Switches:
  - 1. Electrically operated, electrically held.
  - 2. Coil voltage: 120 VAC or as required.
  - 3. Contacts: Totally enclosed, double-break silver-cadmium-oxide.
  - 4. Rated for ballasted lighting, tungsten and general use loads.
  - 5. Number of poles, continuous ampere rating and voltage, as indicated on Drawings or as specified.
  - 6. Auxiliary control relays, as indicated on Drawings or as specified.
  - 7. Auxiliary contacts, as indicated on Drawings or as specified.
- C. Definite Purpose:
  - 1. Coil voltage: 120 VAC or as required.
  - 2. Contacts: Totally enclosed, double-break silver-cadmium-oxide.
  - 3. Resistive load and horsepower rated.
  - 4. Number of poles, continuous ampere rating and voltage, as indicated on Drawings or as specified.
  - 5. Auxiliary contacts, as indicated on Drawings or as specified.

## **2.5 ALARM DEVICES**

- A. Alarm Lights:
  - 1. Panel mounted:
    - a. Strobe type.
    - b. Shatter resistant polycarbonate lens and base.
    - c. Lens color as indicated on Drawings.
    - d. NEMA 4X enclosure.
    - e. PLC compatible.
    - f. Voltage: 120 VAC.
  - 2. Hazardous and corrosive locations:
    - a. Heavy-duty strobe type.
    - b. Weatherproof and rated for the indicated hazardous location.
    - c. Body: Zinc plated cast iron or cast copper free aluminum and/or coated with 20 mils of PVC.
    - d. High impact glass dome with guard.
    - e. Shatter resistant polycarbonate lens with color as indicated on Drawings.
    - f. Immune to shock and vibration, no moving parts.
    - g. Xenon flash tube providing a minimum of 65 single flashes per minute.
    - h. Mounting: Wall bracket or pendant.

## **2.6 MISCELLANEOUS DEVICES**

- A. Run Time Meters:
  - 1. Six-digit wheels including a 1/10 digit.
  - 2. Non-reset type.
  - 3. Time range in hours.
  - 4. Automatic recycle at zero.
  - 5. Accuracy: 1%.
  - 6. Sealed against dirt and moisture.
  - 7. Tamperproof.

## **2.7 TERMINATION EQUIPMENT**

- A. General Requirements:
  - 1. Modular type with screw compression clamp.
  - 2. Screws: Stainless steel.
  - 3. Current bar: Nickel-plated copper alloy.
  - 4. Thermoplastic insulation rated for -40 to +90 DEGC.
  - 5. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
  - 6. End sections and end stops at each end of terminal strip.

7. Machine-printed terminal markers on both sides of block.
  8. Spacing: 6 MM.
  9. Wire size: 22-12 AWG.
  10. Rated voltage: 600 V.
  11. DIN rail mounting.
- B. Standard-Type Block:
1. Rated current: 30 A.
  2. Color: Gray body.
- C. Bladed-Type Disconnect Block:
1. Terminal block with knife blade disconnect which connects or isolated the two sides of the block.
  2. Rated current: 10 A.
  3. Color:
    - a. Panel control voltage leaves enclosure - normal: Gray body, orange switch.
    - b. Foreign voltage entering enclosure: Orange body, orange switch.
- D. Grounded-Type Block:
1. Electrically grounded to mounting rail.
  2. Terminal ground wires and analog cable shields.
  3. Color: Green and yellow body.
- E. Fuse Holders:
1. Blocks can be ganged for multi-pole operation.
  2. Spacing: 9.1 MM.
  3. Wire size: 30-12 AWG.
  4. Rated voltage: 300 V.
  5. Rated current: 12 A.
  6. Fuse size: 1/4 x 1-1/4.
  7. Blown fuse indication.
  8. DIN rail mounting.

## 2.8 ENCLOSURES

- A. Industrial Control Panels:
1. NEMA 4 rated:
    - a. Seams continuously welded and ground smooth.
    - b. No knockouts.
    - c. External mounting flanges.
    - d. Hinged or non-hinged cover held closed with stainless steel screws and clamps.
    - e. Cover with oil resistant gasket.
  2. NEMA 4X rated:
    - a. Body and cover: 14 GA Type 304 or 316 stainless steel.
    - b. Seams continuously welded and ground smooth.
    - c. No knockouts.
    - d. External mounting flanges.
    - e. Hinged door and stainless steel screws and clamps.
    - f. Door with oil-resistant gasket.
  3. NEMA 12 enclosure:
    - a. Body and cover: 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
    - b. No knockouts.
    - c. External mounting flanges.
    - d. Non-hinged stainless steel cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
    - e. Flat door with oil resistant gasket.
  4. Control panel miscellaneous accessories:

- a. Back plane mounting panels: Steel with white enamel finish or Type 304 stainless steel.
  - b. Interiors shall be white or light gray in color.
  - c. Wire management duct:
    - 1) Bodies: PVC with side holes.
    - 2) Cover: PVC snap-on.
    - 3) Size as required.
  - d. Rigid handles for covers larger than 9 SQFT or heavier than 25 LBS.
  - e. Split covers when heavier than 25 LBS.
  - f. Floor stand kits made of same material as the enclosure.
  - g. Weldnuts for mounting optional panels and terminal kits.
  - h. Ground bonding jumper from door, across hinge, to enclosure body.
5. Standards: NEMA 250, UL 508.

## **2.9 FABRICATION**

- A. Supplier of Industrial Control Panels shall build control panel under the provisions of UL 508A or UL 698A.
  - 1. Entire assembly shall be affixed with a UL 508A or UL 698A label "Listed Enclosed Industrial Control Panel" prior to shipment to the jobsite.
  - 2. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
    - a. Determine the SCCR rating by one of the following methods:
      - 1) Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
      - 2) Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
      - 3) Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
    - b. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the control panel circuit originates.
  - 3. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install as indicated and in accordance with manufacturer's recommendations and instructions.
- B. Control Panels:
  - 1. Size as required to mount the equipment.
  - 2. Permitted uses of NEMA 4X enclosure:
    - a. Surface mounted in areas designated as wet and/or corrosive or highly corrosive.
  - 3. Permitted uses of NEMA 12 enclosure:
    - a. Surface mounted in areas designated as dry and/or dusty architecturally or non-architecturally finished areas.
- C. Operator Control Stations:
  - 1. Permitted uses of NEMA 4/13 enclosure:
    - a. Surface mounted in areas designated as dry and/or dusty architecturally or non-architecturally finished areas and wet.
  - 2. Permitted uses of NEMA 4X enclosure:
    - a. Surface mounted in areas designated as wet and/or corrosive or highly corrosive.

### **3.2 FIELD QUALITY CONTROL**

- A. See Section 26 05 00.

- B. Industrial Control Panel(s) and Operator Control Station Functional Test:
  - 1. The test is to prove the correct interaction of all sensing, processing and action devices.
  - 2. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
    - a. Plan shall have witness signature lines for the contractor and owner and submitted when system pass the test.
  - 3. Perform the following tests:
    - a. Verify functionality of all control states.
    - b. Verify the correct operation of all interlock safety devices for fail-safe functions
    - c. Verify the correct operation of all sensing devices, alarms and indicating devices.

### **3.3 TRAINING**

- A. A qualified supplier representative shall provide the Owner with on-site training in the operation and maintenance of the Industrial Control Panel(s) and its components.

**END OF SECTION**

**SECTION 26 28 00**  
**OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Low voltage circuit breakers.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 26 05 00 - Electrical - Basic Requirements.
  - 4. Section 26 08 13 - Acceptance Testing.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. C37.13, Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures.
    - b. C37.16, Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements, and Application Recommendations.
    - c. C37.17, Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers.
  - 2. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 3. Underwriters Laboratories, Inc. (UL):
    - a. 489, Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
    - b. 943, Standard for Safety for Ground-Fault Circuit-Interruption.
    - c. 1066, Standard for Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data including:
    - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
    - b. See Specification Section 26 05 00 for additional requirements.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
  - 1. See Specification Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Reports:
    - a. As-left condition of all circuit breakers that have adjustable settings.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Circuit breakers:
    - a. Eaton.
    - b. General Electric Company.
    - c. Square D Company.
    - d. Siemens.
    - e. Or approved equal.

### **2.2 CIRCUIT BREAKERS**

- A. Molded Case Type:
  - 1. General:
    - a. Standards: UL 489.
    - b. Unit construction.
    - c. Over-center, toggle handle operated.
    - d. Quick-make, quick-break, independent of toggle handle operation.
    - e. Manual and automatic operation.
    - f. All poles open and close simultaneously.
    - g. Three position handle: On, off and tripped.
    - h. Molded-in ON and OFF markings on breaker cover.
    - i. One-, two- or three-pole as indicated on the Drawings.
    - j. Current and interrupting ratings as indicated on the Drawings.
  - 2. Thermal magnetic type:
    - a. Inverse time overload and instantaneous short circuit protection by means of a thermal magnetic element.
    - b. Frame size 150 amp and below:
      - 1) Non-interchangeable, non-adjustable thermal magnetic trip units.
    - c. Frame sizes 225 to 400 amp (trip settings less than 400A):
      - 1) Interchangeable and adjustable instantaneous thermal magnetic trip units.
    - d. Ground Fault Circuit Interrupter (GFCI) Listed:
      - 1) Standard: UL 943.
      - 2) One- or two-pole as indicated on the Drawings.
      - 3) Class A ground fault circuit.
      - 4) Trip on 5 mA ground fault (4-6 mA range).
  - 3. Motor circuit protector:
    - a. Adjustable instantaneous short circuit protection by means of a magnetic or solid state trip element.
    - b. Sized for the connected motor.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Current and interrupting ratings as indicated on the Drawings.
- B. Series rated systems not acceptable.
- C. Devices shall be ambient temperature compensated.
- D. Circuit Breakers:
  - 1. Molded case circuit breakers shall incorporate the following, unless indicated otherwise on the Drawings:
    - a. Frame sizes 400 amp and less with trip setting less than 400A shall be thermal magnetic type.



- b. Motor circuit protectors sized for the connected motor.
- 2. Insulated case circuit breakers shall incorporate the following, unless indicated otherwise on the Drawings:
  - a. Set current sensor or rating plugs long time pick-up setting so that the indicated trip level is near the 75 PCT trip point.

### **3.2 FIELD QUALITY CONTROL**

- A. Adjustable Circuit Breakers:
  - 1. Set all circuit breaker adjustable taps as defined on the Drawings, except adjust motor circuit protectors per the motor nameplate and NFPA 70 requirements.
- B. Ground Fault Protection System:
  - 1. Single source system:
    - a. Main breaker using the residual sensing method system coordinated with individual feeder breakers using the residual sensing method.
    - b. Main and feeder breakers: Utilize four individual current sensors; the phase sensors are integral to the circuit breaker and the neutral sensor is external to the circuit breaker.
- C. Testing:
  - 1. Acceptance testing: See Specification Section 26 08 13.

### **END OF SECTION**



**SECTION 26 28 17**  
**SEPARATELY MOUNTED CIRCUIT BREAKERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Separately mounted circuit breakers.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 26 05 00 - Electrical - Basic Requirements.
  - 4. Section 26 28 00 - Overcurrent and Short Circuit Protective Devices.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. Underwriters Laboratories, Inc. (UL):
    - a. 489, Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures.
    - b. 1203, Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data:
    - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
    - b. Provide a table that associates equipment model number with equipment tag number.
    - c. See Specification Section 26 05 00 for additional requirements.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Eaton.
  - 2. General Electric.
  - 3. Square D by Schneider Electric.
  - 4. Siemens Corporation.
  - 5. Appleton by Emerson Electric Co.
  - 6. Crouse-Hinds by Eaton.
  - 7. Killark by Hubbell.
  - 8. Or approved equal.

- B. Submit request for substitution in accordance with General Provisions Article 5.

## **2.2 COMPONENTS**

- A. NEMA 1 rated:
  - 1. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
  - 2. With or without knockouts, hinged or unhinged cover.
  - 3. Breaker is front operable and padlockable in the OFF position.
  - 4. Suitable for service entrance.
- B. NEMA 4 rated:
  - 1. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
  - 2. No knockouts, external mounting flanges, hinged and gasketed door.
  - 3. Front operating handle padlockable in the OFF position and interlocked to prevent door from opening when the breaker is ON.
  - 4. Suitable for service entrance.
- C. NEMA 4X rated:
  - 1. Body and cover: Type 304 or 316 stainless steel.
  - 2. No knockouts, external mounting flanges, hinged and gasketed door.
  - 3. Front operating handle padlockable in the OFF position and interlocked to prevent door from opening when the breaker is ON.
  - 4. Suitable for service entrance.
- D. NEMA 7 and 9 rated:
  - 1. Cast gray iron alloy or copper-free aluminum with manufacturer's standard finish.
  - 2. Drilled and tapped openings or tapered threaded hub.
  - 3. Gasketed cover bolted-down with stainless steel bolts.
  - 4. External mounting flanges.
  - 5. Front operating handle padlockable in the OFF position.
  - 6. Suitable for service entrance.
  - 7. Accessories: 40 MIL PVC exterior coating.
- E. NEMA 12 rated:
  - 1. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
  - 2. No knockouts, external mounting flanges, hinged and gasketed door.
  - 3. Front operating handle padlockable in the OFF position and interlocked to prevent door from opening when the breaker is ON.
  - 4. Suitable for service entrance.
- F. Standards: UL 489 and UL 1203 for hazardous locations.
- G. Overcurrent and short circuit protective devices:
  - 1. Molded case circuit breaker.
  - 2. See Section 26 28 00 for overcurrent and short circuit protective device requirements.
  - 3. Factory installed.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install as indicated and in accordance with manufacturer's recommendations and instructions.
- B. Permitted uses of NEMA 1 enclosure:
  - 1. Surface or flush mounted in areas designated dry in architecturally finished areas.

- C. Permitted uses of NEMA 4X enclosure:
  - 1. Surface mounted in areas designated as wet and/or corrosive.
- D. Permitted uses of NEMA 7 enclosure:
  - 1. Surface mounted in areas designated as Class I hazardous.
    - a. Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.
- E. Permitted uses of NEMA 9 enclosure:
  - 1. Surface mounted in areas designated as Class II hazardous.
    - a. Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.
- F. Permitted uses of NEMA 12 enclosure:
  - 1. Surface mounted in areas designated as dry in non-architecturally finished areas.

**END OF SECTION**



**SECTION 26 29 23**  
**VARIABLE FREQUENCY DRIVES - LOW VOLTAGE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Variable frequency drives (VFDs) for operation of inverter duty motors.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 10 14 00 - Identification Devices.
  - 4. Section 26 05 00 - Electrical - Basic Requirements.
  - 5. Section 01 61 03 - Equipment - Basic Requirements.
  - 6. Section 40 67 00 - Control System Equipment Panels and Racks.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. ETL Testing Laboratories (ETL).
  - 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. 399, Recommended Practice for Industrial and Commercial Power Systems Analysis.
    - b. 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
    - c. C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
  - 4. National Electrical Manufacturer's Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. MG 1, Motors and Generators.
  - 5. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC):
      - 1) Article 430, Motors Motor Circuits, and Controllers.
  - 6. Occupational Safety and Health Administration (OSHA).
  - 7. Underwriters Laboratory, Inc. (UL):
    - a. 508, Standard for Industrial Control Equipment.
    - b. 508A, Standard for Industrial Control Panels.
- B. Qualifications:
  - 1. Provide drives that are listed and labeled by UL, ETL, or other Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA regulations, or that have been inspected and subsequent field-labeled by such NRTL.
  - 2. Where listed drives and other components are installed in a common enclosure, the assembly shall be listed and labeled per UL 508 and UL 508A or equivalent NRTL standard.
    - a. Entire assembly shall be affixed with a UL 508A label "Listed Enclosed Industrial Control Panel" or equivalent NRTL label prior to shipment to the jobsite.
  - 3. VFD Supplier shall maintain an authorized service organization within 300 miles of the Project Site.
- C. Coordination:
  - 1. The intent of this Specification Section is to allow the VFD manufacturer to provide the best solution for the harmonic and motor protection outlined herein.
    - a. This solution shall include, but not be limited to, all aspects of the distribution system including standby generation, motor feeder cable type and available floor space.

2. Motor and VFD coordination: See Specification Section 01 61 03 and Specification Section 26 05 09.
3. VFD shall be supplied complete with all required control components.
  - a. Provide control as indicated:
    - 1) On the electrical drawings.
    - 2) As specified in this Specification Section.
    - 3) As specified in the process control system loop descriptions.
  - b. VFD manufacturer shall review the application and provide, at no additional cost to the Owner, the hardware and software necessary to allow the VFD to control the driven equipment motor over its required operating range.
    - 1) These may include, but are not limited to, analog and digital interface modules, communication interface modules, switches, lights and other devices.
  - c. Coordinate control devices with devices furnished with driven equipment such as vibration switches, thermal sensors, leak detectors, etc.
4. Verify plan dimensions with equipment space requirements as indicated on the Drawings.
  - a. Equipment which exceeds the allotted maximum dimensions may not be acceptable.
  - b. Equipment which reduces clear work space below the minimums established by the NFPA 70 will not be acceptable.

### 1.3 DEFINITIONS

- A. Variable Torque (VT):
  1. Defines a load characteristic in which the torque delivered from the motor to the load is reduced as speed is reduced below full rated.
  2. This type of load permits the VFD and the motor to operate at reduced output current at reduced speed.
- B. Constant Torque (CT):
  1. Defines a load characteristic in which the torque delivered from the motor to the load remains constant as speed is varied.
  2. This type of load requires the VFD to be able to continuously deliver rated output current over the entire speed range.
- C. Constant Horsepower:
  1. Defines a load characteristic in which the torque delivered from the motor to the load is reduced as the speed is increased.
  2. This characteristic is required for operation of the VFD and motor above rated frequency to maintain output current within the rated value.
- D. Inverter Duty Motor: An AC induction motor complying with all requirements of NEMA MG 1 Part 31 for definite-purpose inverter-fed motors.
- E. Standard Motor: An AC induction motor that fails to comply with one or more requirements of NEMA MG 1 Part 31.
- F. Low Voltage: 600 VAC or less.

### 1.4 SUBMITTALS

- A. Shop Drawings:
  1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  2. Provide a schedule for each VFD including the following information:
    - a. Equipment Tag Number.
    - b. VFD Complete Catalog Number.
    - c. VFD Amp Frame Size.
    - d. Variable or Constant Torque Rating Basis.
    - e. Rated Input Current.
    - f. Rated Continuous Output Current.
    - g. Rated Short Circuit Current.



- h. VFD cable type specified (shielded or non-shielded).
- i. VFD Maximum Motor Lead Length for the type of cable used.
- j. Motor Manufacturer.
- k. Motor Frame Size.
- l. Motor Full Load Amps.
- m. Motor Service Factor.
- n. As installed motor Lead Length.
- o. VFD options provided to meet harmonic or motor protection specifications.
- 3. Submit VFD Shop Drawings concurrently with driven equipment and motor Shop Drawings.
- 4. Product technical data:
  - a. Complete electrical ratings and performance specifications confirming compliance with specified ratings and performance.
  - b. Maximum rate of heat rejection from VFD and all related components and associated cooling requirements.
  - c. Manufacturer's installation instructions.
  - d. Manufacturer's programming and operating instructions.
  - e. See Specification Section 26 05 00 for additional requirements.
- 5. Fabrication and/or layout drawings:
  - a. Top, front, and side exterior views, with details showing maximum overall dimensions of enclosure, mounting provisions and conduit/cable entry provisions.
  - b. Identify minimum clearances from other VFDs or electrical equipment required for proper cooling at top, bottom, side and back of enclosure.
  - c. Three-line diagrams showing AC schematic of VFD, input, output and bypass devices including device ratings.
  - d. Interior layout drawings showing location of all components within enclosure, field wiring terminal boards, and power and grounding connections.
  - e. Field wiring diagrams showing locations and sizes of all electrical connections, ground terminations, and requirements for shielded wire usage or any other special installation considerations.
  - f. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70, include any required calculations.
- 6. Certifications:
  - a. Submit with Shop Drawings:
    - 1) Identification and location of closest authorized service organization.
    - 2) Harmonic analysis at each PCC per Harmonic Protection Requirements Article.
  - b. Submit prior to shipment:
    - 1) Certified factory test reports confirming compliance with specified requirements.
  - c. Submit after installation:
    - 1) Certified field service reports showing:
      - a) Each VFD is operational.
      - b) Each VFD and its driven equipment motor are compatible.
      - c) Each VFD responds correctly to the input control signals.
      - d) Critical frequencies of the drive system and that the VFD has been set to lockout these frequencies.
      - e) Measured harmonic levels per Harmonic Protection Requirements Article.
      - f) Measured motor terminal peak voltages per Motor Protection Requirements Article.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
  - 2. Approved copy of VFD schedule per Submittals Article.
  - 3. Manufacturer's instruction manuals.

4. Troubleshooting procedures with a cross-reference between symptoms and corrective recommendations.
5. Connection data to permit removal and installation of recommended smallest field-replaceable parts.
6. Recommended spare parts list.
7. Commissioning sheets showing “as-left” values of all user-programmable or adjustable drive parameters.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  1. Allen Bradley.
  2. ABB.
  3. Eaton.
  4. Danfoss.
  5. Siemens/Robicon.
  6. Siemens.
  7. Square D Company.
  8. Toshiba.
  9. Yaskawa.
  10. Or approved equal.

### **2.2 GENERAL**

- A. VFDs shall consist of a rectifier-DC bus-inverter combination producing a sine-coded pulse-width-modulated (PWM) output voltage waveform.
- B. VFDs, whether installed in motor control center (MCC) construction or separately-mounted, shall constitute a complete combination motor controller per NFPA 70, Article 430 and shall provide the following per the requirements of that article without the addition of any external components or devices.
  1. Motor control.
  2. Motor overload protection.
  3. Motor and motor branch circuit short circuit and ground fault protection.
  4. Motor and controller disconnecting means.
- C. It is the intent of this Specification that VFDs shall be an “engineered” or “configured” drive package in which the VFD chassis, all input, output and bypass power devices, VFD accessories, ancillary switches, contactors, relays, and related control devices are selected, furnished, factory-assembled and -tested by the VFD manufacturer in a single enclosure requiring only connection of the power supply circuit, motor branch circuit, and external control wiring in the field.

### **2.3 PERFORMANCE AND DESIGN REQUIREMENTS**

- A. Application:
  1. VFD(s) shall be of sufficient capacity and shall provide a quality of output waveform for stepless motor control from 10 to 100 PCT of base speed of the driven equipment.
  2. VFDs shall be compatible with:
    - a. Inverter duty induction motors.
  3. VFDs shall be suitable for Constant Torque (CT) or Variable Torque (VT) applications.
    - a. VFD manufacturer shall coordinate with the manufacturer of the driven equipment to identify CT and VT applications.
  4. VFDs shall be designed to operate successfully under the following site conditions:
    - a. Ambient:
      - 1) Temperature: 0-60 DEGC.
      - 2) 95 PCT non-condensing relative humidity.

- b. Elevation: 220 FT above MSL.
  - c. Power supply characteristics:
    - 1) 480Vac, 3 PH, 60 Hz, 3 wire, ( $\pm 10$  PCT).
    - 2) Effectively grounded.
- B. Ratings and Performance Specifications:
  - 1. Voltage rating:
    - a. Nominal: 460 or 480 VAC, 3 PH, 60 Hz.
    - b. Range for continuous full load operation:  $\pm 10$  PCT of nominal.
    - c. Voltage imbalance tolerance for full load operation: 3 PCT minimum.
  - 2. Current ratings:
    - a. Continuous:
      - 1) Equal to or greater than the motor nameplate full load.
    - b. Short-term overload:
      - 1) VT: 110 PCT for 1 minute.
      - 2) CT: 150 PCT for 1 minute.
      - 3) Permissible for 1 minute every 10 minutes continuously.
    - c. Short circuit:
      - 1) As indicated on the Drawings.
      - 2) Where a short circuit rating is not indicated or specified for individual VFDs, each VFD shall have a rating not less than indicated on the Drawings for the MCC, switchboard or panelboard the VFD is supplied from.
      - 3) Where specified short circuit rating indicates additional input impedance is required to protect semiconductors, provide input AC line reactors, whether required to meet harmonic performance specifications or not.
  - 3. Efficiency:
    - a. 97 PCT, minimum, at full speed and full load.
    - b. 93 PCT, minimum at 1/2 speed and full load.
  - 4. Displacement power factor:
    - a. 95 PCT, minimum from 50 PCT to 100 PCT speed and load.
  - 5. Efficiency and power factor criteria apply from the input terminals to the output terminals of the VFD alone, excluding losses of input and output power circuit accessories.
  - 6. Frequency drift:
    - a.  $\pm 0.5$  PCT of set frequency.
  - 7. Speed regulation (motor dependent): 3 PCT.
  - 8. Speed range: 10:1.
  - 9. Control type:
    - a. Volts/Hertz ratio; constant over the entire operating range of the VFD except:
      - 1) When operating under voltage boost.
      - 2) At frequencies over 60 Hz.
- C. Operational Features:
  - 1. Insensitive to input phase sequence.
  - 2. Continued operation with momentary voltage dips of 25 PCT of rated voltage, or single phase condition: 4 SEC, minimum.
  - 3. Controls power loss ride-through: 500 MSEC, minimum.
  - 4. Electronic reversing.
  - 5. DC injection braking.
  - 6. Anti-windmilling: Synchronization of VFD starting frequency with spinning or coasting load, forward or reverse.
  - 7. Critical frequency band lockout:
    - a. Minimum of three settings.
    - b. Adjustable bandwidth, 1 - 5 Hz.
  - 8. Capable of operating without the motor connected for start-up and troubleshooting.
- D. The VFD shall be provided with the following minimum user-programmable parameters:
  - 1. Carrier frequency.

2. Independent maximum and minimum speeds for forward and reverse operation.
  3. Start frequency and hold time.
  4. Independent linear acceleration and deceleration time.
  5. Preset "jog" speed.
  6. Three critical frequency bands.
  7. One preset speed selectable by logic input.
  8. Volts/Hertz ratio.
  9. Voltage boost, magnitude and frequency range.
  10. Process controller gain, offset and bias.
  11. Current limit.
  12. Overcurrent pickup.
  13. Overcurrent delay.
  14. Ground fault pickup.
  15. DC injection level and time.
- E. The VFD shall be designed such that the power circuit components are fully protected from line side disturbances and load side faults:
1. General:
    - a. Shutdown conditions associated with supply circuit conditions which can be corrected external to the VFD-motor system shall be provided with automatic reset, with shutdown cause logged in memory:
      - 1) Input under voltage.
      - 2) Input over voltage.
      - 3) Input under frequency.
      - 4) Input over frequency.
      - 5) Input Phase loss.
      - 6) DC Bus under voltage.
    - b. Shutdown conditions which indicate overload or fault within the VFD, the output circuit, or the motor shall require local manual reset at the VFD, requiring operator intervention.
      - 1) Over temperature.
      - 2) Blown fuse.
      - 3) Component failure.
      - 4) Overload.
      - 5) Short circuit.
      - 6) Ground fault.
      - 7) DC Bus over voltage.
      - 8) External safety input (e.g., motor thermal protection).
      - 9) Logic fault.
    - c. When automatic shutdown occurs, VFD shall restart immediately upon reset, whether automatic or manual.
    - d. VFD shall hold cause of trip data for a minimum of four shutdowns in memory.
      - 1) Data to be accessible through the keypad, local communication link and remotely.
  2. Input protection:
    - a. Input circuit breaker or current-limiting fuses with externally operable disconnect.
      - 1) Fault current interrupting rating equal to or greater than the specified withstand rating of the VFD.
      - 2) Handle padlockable in the OFF position.
    - b. Provide full protection for semiconductors integral to the VFD; units requiring current-limiting fuses or circuit breakers in the supply circuit are not acceptable.
    - c. Incoming line transient suppression.
      - 1) 6000V peak per IEEE C62.41.
      - 2) Phase-to-phase and phase-to-ground protection.
    - d. Sustained over voltage trip.
  3. Internal protection:
    - a. Surge suppression and power device snubbers.

- b. Power devices rated at 2.5 times line voltage.
- c. Instantaneous over current trip.
- d. DC bus over voltage trip.
- e. Power device over temperature trip.
- f. Control logic circuit malfunction trip.
- 4. Output protection:
  - a. Inverse-time overload trip:
    - 1) UL Class 10 characteristic.
  - b. Over voltage trip.
  - c. Over frequency trip.
  - d. Short circuit trip.
    - 1) Line to line and line to ground.
  - e. Ground fault trip.

## 2.4 OPERATOR AND REMOTE CONTROL INTERFACE

- A. Drive controls shall be microprocessor-based with on-board human machine interface and both local and remote digital communications capability.
  - 1. All monitoring and control functions, other than those shutdowns specified to be manual reset only, shall be available both locally and remotely.
- B. Control circuits shall be 120 VAC or 24 VAC or 24 VDC.
  - 1. 120 VAC supplied by CPT in the VFD.
    - a. CPT shall have minimum additional capacity of 60 VA greater than that required by control devices.
    - b. CPT shall have two fuses on the primary side and one fuse on the secondary side.
    - c. CPT shall have surge protection on the primary side independent of any other surge protection in the VFD.
  - 2. 24 VAC or 24 VDC supplied by Class 2 power supply in the VFD.
    - a. Power supply shall have minimum additional capacity of 33 PCT greater than that required by control devices.
    - b. Provide two current-limiting fuses on the AC supply to the power supply.
    - c. Power supply shall have surge protection on the primary side independent of any other surge protection in the VFD.
- C. Operator Interface:
  - 1. Door mounted sealed keypad, membrane type with LED or LCD display.
    - a. Messages shall be in English and engineering units.
    - b. Drive operating parameters shall be programmable.
    - c. Menu driven.
    - d. Password security.
    - e. Display fault and diagnostic data.
    - f. Operating parameters, fault and diagnostic data maintained in non-volatile memory with historic log of fault and diagnostic data.
    - g. Gold plated plug-in contacts.
  - 2. Provide indication and control interface, integral in the keypad, as required in the sequence of operation and Drawings.
    - a. Minimum indications:
      - 1) Run.
      - 2) Stop.
      - 3) Ready.
      - 4) Alarm.
      - 5) Fault.
      - 6) Local control.
      - 7) Remote control.
      - 8) Control source local.
      - 9) Control source remote.
      - 10) Speed indication.

- b. Minimum control functions:
      - 1) Local/Remote switch.
      - 2) Stop button.
      - 3) Start button.
      - 4) Reset button.
      - 5) Speed control buttons.
  - 3. Diagnostic indicators located externally on the face of the drive shall show the type of fault responsible for drive warning, shutdown or failure.
    - a. On occurrence of more than one condition, each shall be recorded or indicated by the diagnostics.
- D. Remote Control Interface:
  - 1. Local portable computer interface via RS232/RS242 serial communications port:
    - a. Capability to:
      - 1) Start-Stop VFD.
      - 2) Control VFD Speed.
      - 3) Access fault and diagnostic data.
  - 2. Analog and discrete inputs:
    - a. Speed reference (setpoint) signal 4-20 mA DC.
    - b. Isolated process PID controller with user-programmable setpoint, gain, rate, reset and span for accepting a remote 4-20 mA DC process variable signal.
  - 3. Analog and discrete outputs:
    - a. 4-20 mA DC output for remote speed indication, as a function of frequency, calibrated 0 to 100 PCT.
    - b. Drive FAULT contacts.
    - c. Drive RUNNING contacts.
    - d. Drive selector switch in AUTO status contacts.
  - 4. Contacts:
    - a. Contacts shall be rated 2 A inductive at 120 VAC.
    - b. All contacts shall be wired to field wiring terminal boards.
  - 5. Drive shutdown on external fault input:
    - a. Provide isolated input for dry contact from external motor or system safety devices to cause immediate shutdown of VFD.
    - b. Safety shutdown to be operable in all operating modes of drive, including local operation from keypad.
    - c. For submersible pump/motors incorporate the temperature/leak detection monitor and shut down.
    - d. Local safety switch, to driven equipment, auxiliary contact to lock-out VFD from running when safety switch is open.
  - 6. Network communications capability:
    - a. Provide VFD with communication card, protocol and required programming for digital communication of all VFD program and operational parameters to plant control system via:
      - 1) Ethernet IP.

## 2.5 HARMONIC PROTECTION REQUIREMENTS

- A. All VFDs shall be capable of satisfactory operation from a source having voltage distortion and notch characteristics identified as acceptable for a “dedicated system” in IEEE 519 Table 10.2.
- B. With all VFDs operating under worst-case harmonic current conditions, and the facility supplied from either or both the utility and generator sources, the VFDs shall not produce harmonic effects in excess of the following limits at any point of common coupling (PCC).
  - 1. Voltage distortion and notch characteristics: IEEE 519 Table 10.2 for General System.
  - 2. Current distortion: IEEE 519 Table 10.
- C. PCC shall be considered:
  - 1. Building service entrance switchgear, switchboard or MCC.

2. Each MCC, switchboard, switchgear, or panelboard supplying a VFD branch circuit.
- D. The Engineer has performed preliminary calculations based on typical VFD data which indicate that the minimum mitigation measures required to meet the specified harmonic criteria are one of the following topologies:
  1. 6-pulse rectifier topology with input line reactors and output load reactors, minimum impedance 3 PCT on drive kVA base.
  2. 6-pluse rectifier topology with tuned passive filter with controls such that the filter is not energized when VFD is off or starting for each VFDs.
  3. 18-pulse rectifier topology for each VFDs.
  4. Active filters or active front end rectifier topology for each VFDs.
  5. Active harmonic filter (specified elsewhere) at each PCC.
- E. VFD manufacturer shall determine, for their proposed equipment, uncorrected harmonic distortion levels and mitigation techniques required to meet the specified limits and shall furnish the VFD types and all accessory items and equipment necessary to do so, whether specified herein or not.
- F. VFD manufacturer shall provide a harmonic analysis of the distribution system based on their proposed specific equipment characteristics and mitigation techniques confirming that the specified levels are not exceeded.
  1. Analysis shall be based on the methodology of IEEE 519 and IEEE 399.
  2. Power system data for analysis shall be taken from the electrical drawings and approved equipment submittals.
    - a. VFDs provided in a package with equipment specified elsewhere, shall be included in the analysis.
- G. Following start-up, with facility at full load operation, provide measurement of harmonic voltage, current and notch characteristics at each PCC according to the requirements of IEEE 519 Section 9.
  1. Values in excess of specified limits require correction by contractor and re-measurement.
  2. Provide certification of compliant measurements as part of Field Service Engineer's final report.

## 2.6 MOTOR PROTECTION REQUIREMENTS

- A. The VFD shall produce a quality of output waveform adequate to allow the motor to produce rated torque at rated RPM continuously without exceeding the temperature rise given in NEMA MG 1 Table 31-2.
- B. Provide motor overload, short circuit and ground fault protection integral to drive electronics.
- C. The VFD shall not produce voltage spikes in excess of the following values at the motor terminals when operated with the feeder types shown on the Drawings and the actual installed feeder lengths.
  1. If unmitigated voltage peaks exceed the specified limits, provide output line reactors, filters, or other devices as required to meet the specified limits:
    - a. Inverter duty motors: 1280 V.
    - b. Rise time shall be greater than or equal to 0.1 microsecond.
    - c. Motor lead length and data shall be determined by the Contractor based on the actual routing of the conductors.

## 2.7 EQUIPMENT CONSTRUCTION

- A. Fabrication and Assembly:
  1. Each VFD system shall be factory-assembled in an enclosure for remote mounting, and shall utilize interchangeable plug-in printed circuit boards and power conversion components wherever possible.
    - a. Factory assembly shall be performed by the VFD manufacturer or authorized agent.
    - b. Systems fabricated or assembled in whole or in part by parties other than the VFD manufacturer or authorized agent will not be acceptable.

2. Reactors and/or filters, where required, shall be mounted within or in an ancillary enclosure adjacent to the drive enclosure, or with the Engineer's permission may be mounted in a separate enclosure.
  3. Cooling fans, as required, shall be provided to run when drive is running.
  4. Enclosures for separately mounted VFD's:
    - a. NEMA Type 1 for installation in Electrical Rooms.
    - b. NEMA Type 12 for installation in other unclassified areas.
- B. Wiring:
1. The wiring in the VFD shall be neatly installed in wire ways or with wire ties where wire ways are not practical.
    - a. Where wire ties are used, the wire bundles are to be held at the back panel with a screw-mounted wire tie mounting base.
    - b. Bases with a self-sticking back will not be allowed.
  2. All plug-in contacts shall be gold-plated.
  3. Provide terminal boards for all field wiring and inter-unit connections, including analog signals.
    - a. Provide terminals for shield continuity where required.
  4. Terminal blocks shall be complete with marking strip, covers and pressure connectors.
    - a. Non-brittle, interlocking, track-mounted type.
    - b. Screw terminals will not be allowed.
    - c. A terminal for each conductor of external circuits plus one ground for each shielded cable.
    - d. For free-standing panels, 8 IN of clearance shall be provided between terminals and the panel base for conduit and wiring space.
    - e. Not less than 25 PCT spare terminals shall be provided.
    - f. Terminals shall be labeled to agree with identification indicated on the suppliers submittal drawings.
    - g. Individually fuse each control loop or system and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.
  5. All grounding wires shall be attached to the enclosure sheet metal with a ring tongue terminal.
    - a. The surface of the sheet metal shall be prepared to assure good conductivity and corrosion protection.
  6. Wiring shall not be kinked or spliced and shall have markings on both ends or be color coded.
    - a. Markings or color code shall match the manufacturer's drawings.
  7. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, type MTW or SIS, insulated for not less than 600 V, with a moisture-resistant and flame-retardant covering rated for not less than 90 DegC.
- C. Nameplates:
1. All devices mounted on the face of the drive shall be provided with a suitable nameplate as specified in Specification Section 10 14 00.
  2. Push buttons, selector switches, and pilot lights shall have the device manufacturer's standard legend plate.
  3. Relays, terminals and special devices inside the control enclosure shall have permanent markings to match identification used on manufacturer's wiring diagrams.
- D. Painting: Enclosure, after being phosphate washed, shall be thoroughly cleaned and given at least one (1) coat of rust-inhibiting primer on all inner surfaces prior to fabrication.

## 2.8 COMPONENTS AND ACCESSORIES

- A. Reactors:
1. Impedance: As required.
  2. Continuous current: Not less than drive rating.



3. Current overload: 150 PCT for 1 minute.
4. Insulation temperature rating: 180 DEGC.
5. Copper windings.
6. Saturation current rating: 3.5 to 5 times rated current.
7. Hi-potential rating: 2500 VAC line to ground and line to line, for 1 minute.
8. Noise reduction features:
  - a. Epoxy over cast coil.
  - b. Extra dips and bakes of varnish over continuous wound coil.

## 2.9 SOURCE QUALITY CONTROL

- A. Factory Tests:
  1. Conduct all standard tests in accordance with NEMA and ANSI standards to ensure conformance to Specification requirements.
  2. Prior to final assembly:
    - a. Inspect incoming components.
    - b. Test and inspect power devices.
    - c. Circuit cards:
      - 1) Component and functional tests:
      - 2) Burn-in chamber or temperature cycling test.
      - 3) System Test after burn-in or temperature cycling.
  3. After final assembly:
    - a. Continuity and insulation test of 480 power control circuits.
    - b. Drive tests:
      - 1) Burn-in complete drive at full load for 24 HRS.
      - 2) Verify all auxiliary circuits operation.
      - 3) Monitor output variables.
    - c. Systems test:
      - 1) Provide inputs to field connections and simulate on-site operations.
      - 2) Test all auxiliary equipment.

## 2.10 MAINTENANCE MATERIALS

- A. Provide manufacturer's recommended renewable spare parts (e.g., power and control fuses).
- B. Spare parts utilized during pre-start-up or start-up and demonstration testing shall be immediately restocked, at no cost to the Owner.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and as indicated on the Drawings.
- B. Provide separately mounted VFD enclosure with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
  1. Determine the SCCR rating by one of the following methods:
    - a. Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
    - b. Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
    - c. Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
  2. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the equipment or control panel circuit originates.
  3. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.
- C. Verify the installed motor nameplate electrical requirements do not exceed the VFD capacity.

- D. Provide services of manufacturer's representative to perform start-up services.
- E. The selection of input and output harmonic and voltage spike protection shall also be made on the available physical space.
  - 1. The space available on the Drawings shall not be exceeded.

### 3.2 START UP

- A. Pre-start-up Services:
  - 1. Shall be completed a minimum of 30 days prior to the start-up.
  - 2. Shall consist of:
    - a. Physical and electrical installation check.
    - b. Final adjustments and calibration of drive parameters.
    - c. VFD operation from simulated input signals.
  - 3. Shall be complete when VFD(s) are fully operational.
- B. Field Quality Control:
  - 1. Perform field measurement of harmonics at each PCC per Harmonic Protection Requirements Article.
    - a. For each individual VFD.
    - b. For the maximum number of VFDs that will be operational at the same time.
    - c. When all loads are at 75 PCT load minimum.
    - d. Duration: 1 HR minimum.
  - 2. Record all data necessary for the preparation of required test reports.
- C. Start-up and Demonstration Services:
  - 1. Supervise start-up of all units including recheck of settings made during the pre-start-up tests.
    - a. Perform all work in the presence of the Owner's designated representatives.
  - 2. Setup all VFDs with carrier frequency at minimum value consistent with proper operation; inform Engineer of carrier frequencies set in excess of 5 kHz and reason for setting.
  - 3. Simulate operation of the VFD and its associated control and instrumentation system in both the manual and automatic modes.
    - a. Ensure compatibility of VFD with associated control and instrumentation signals.
  - 4. Simulate VFD failures and demonstrate troubleshooting aids.
- D. Instruct Owner's designated personnel:
  - 1. Minimum of 8 HRS at the jobsite.
  - 2. Include both field and classroom instruction.
  - 3. Instructions shall include proper operation and maintenance procedures including, but not limited to:
    - a. Troubleshooting.
    - b. Repair and replacement.
    - c. Parts inventory.
    - d. Maintenance records.

### 3.3 SCHEDULES

- A. Several motors may have full load amps (FLA) different than that listed in NFPA 70.
  - 1. The following table is an estimate for the FLA of the motors based on NFPA 70.

EQUIPMENT TAG	HP	RPM	NEC FLA	LOAD TYPE
VFD308	60	1180	77	Variable-Torque
VFD309	60	1180	77	Variable-Torque
VFD310	60	1180	77	Variable-Torque

### END OF SECTION

**SECTION 31 23 33**  
**TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Excavation, trenching, backfilling and compacting for all underground utilities.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. ASTM International (ASTM):
    - a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 FT-LBF/FT<sup>3</sup> (600 kN-M/M<sup>3</sup>)).
    - b. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
    - c. D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- B. Qualifications: Hire an independent soils laboratory to conduct in-place moisture-density tests for backfilling to assure that all work complies with this Specification Section.

**1.3 DEFINITIONS**

- A. Excavation: All excavation will be defined as unclassified.
- B. CLSM: Controlled Low Strength Material.

**1.4 DESIGN CRITERIA**

- A. Trench Shoring System:
1. The Contractor's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The Contractor, prior to beginning any trench or structure excavation 5 FT deep or over shall submit to the Engineer and shall be in receipt of the Engineer's written acceptance of the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, monument monitoring, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared and sealed by a civil or structural engineer licensed in the State of California.
  2. The Contractor's attention is also directed to the California Code of Regulations, Title 8, Section 1541.1. The code requires when excavation is adjacent to an existing structure, a registered professional engineer must approve the determination that such excavation work will not pose a hazard to employees. It is the Contractor's responsibility to hire a California Registered Civil Engineer to prepare analysis on trench safety, and to install all safety measures recommended by the Registered Engineer.
  3. Excavation support systems shall be designed by the Contractor to support earth pressure, unrelieved hydrostatic pressure, utility loads, equipment, applicable traffic loads, and other surcharge loads in such manner as will allow safe construction and will prevent damage to adjacent structures (including existing pipelines and utilities) and injury to workers and the public. In addition, a shoring deflection analysis shall be performed. The installation of excavation support system shall not cause a disruption to public convenience and access. Design shall be prepared and sealed by a California registered Civil or Structural Engineer.
  4. If utilized, all soldier piles shall be placed in pre-drilled holes and grouted in-place to a depth in accordance with the Contractor's Plan.

5. The owner's approval of the Contractor's plans and methods of construction does not relieve the Contractor of the responsibility for adequacy of the design, installation or resulting trench support.

## **1.5 SUBMITTALS**

- A. Shop Drawings:
  1. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
  2. Submit respective pipe or conduit manufacturer's data regarding bedding methods of installation and general recommendations.
  3. Submit sieve analysis reports on all granular materials.
  4. Excavation Support System:
    - a. Submit prior to the installation of excavation support system the following:
      - 1) Supporting calculations sealed by a Professional Engineer licensed in the State where the project is located.
      - 2) Detail drawings sealed by a Professional Engineer licensed in the State where the project is located, showing type and location of support system.
- B. Informational Submittals:
  1. Trench shield (trench box) certification if employed:
    - a. Specific to Project conditions.
    - b. Re-certified if members become distressed.
    - c. Certification by registered professional structural engineer, registered in the state where the Project is located.
    - d. Engineer is not responsible to, and will not, review and approve.

## **1.6 SITE CONDITIONS**

- A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving.
  1. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.
- B. Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent serious interruption of travel.
- C. Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.
- D. Verify location of existing underground utilities.

## **1.7 REGULATORY REQUIREMENTS**

- A. Regulatory requirements that govern the work of this Section include the following governing codes:
  1. California Code of Regulations, Title 8, Chapter 4, Subchapter 4 – Construction Safety Orders, and Subchapter 19 – Trench Construction Safety Orders.
  2. California Code of Regulations, Title 24, Part 2, California Building Code, Chapter 33 and Appendix Chapter 22, and Structural Chapters 18 and 18A.
    - a. Evacuations shall be defined or classified as being in excess of 12 feet in depth below grade, and, as such, shall comply fully with the requirements of Sections 3301.2, 3301.2a, and 3301.03 of the California Building Code.
    - b. Contrary to certain provisions of the California Building Code, Sections 3301.2 and 3301.2a, extensions of foundations, if any, regardless of depth, shall be at the expense of the Contractor, and the Contractor shall make provisions for such expense.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Backfill Material:
1. As approved by Engineer.
    - a. Free of rock cobbles, roots, sod or other organic matter, and frozen material.
    - b. Moisture content at time of placement:  $\pm 3\%$  of optimum moisture content as specified in accordance with ASTM D698.
- B. Bedding Material:
1. Provide a minimum of 6 IN of bedding material under all buried piping.
  2. Granular materials:
    - a. Must consist of sand:
      - 1) Free of clay or organic material
      - 2) Suitable for the purpose intended
      - 3) Complying with the gradation requirements shown in the following table:

Sieve size	Percentage passing
No. 4	90–100
No. 200	0–5

- C. CLSM and Embedment Material:
1. Provide CLSM for the embedment (trench zone) of all buried piping.
  2. Flowable fill:
    - a. Description: Flowable fill shall be a mixture of cement, fly ash, fine sand, water, and air having a consistency which will flow under a very low head.
    - b. Material characteristics:
      - 1) The approximate quantities of each component per cubic yard of mixed material shall be as follows:
        - a) Cement (Type I or II): 50 LBS.
        - b) Fly ash: 200 LBS.
        - c) Fine sand: 2,700 LBS.
        - d) Water: 420 LBS.
        - e) Air content: 10%.
      - 2) Actual quantities shall be adjusted to provide a yield of 1 cubic yard with the materials used.
      - 3) Approximate compressive strength should be 85 to 175 PSI.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

- A. Unclassified Excavation: Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by Owner.
- B. Excavation for Appurtenances:
1. 12 IN (minimum) clear distance between outer surface and embankment.
- C. Groundwater Dewatering:
1. Groundwater is expected to be encountered during excavation. Install a dewatering system to prevent softening and disturbance of subgrade to allow subgrade stabilization, pipe, bedding and backfill material to be placed in the dry, and to maintain a stable trench wall or side slope.
  2. Groundwater shall be drawn down and maintained at least 3 FT below the bottom of any trench excavation prior to excavation.
  3. Employ dewatering specialist for selecting and operating dewatering system.

4. Keep dewatering system in operation until dead load of pipe, structure and backfill exceeds possible buoyant uplift force on pipe or structure.
5. Dispose of groundwater to an area which will not interfere with construction operations or damage existing construction.
6. Install groundwater monitoring wells as necessary.
7. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
8. Cost of groundwater dewatering shall be included in the lineal foot unit price of the pipe installation.

D. Trench Excavation:

1. Excavate trenches by open cut method to depth shown on Drawings and necessary to accommodate work.
  - a. Support existing utility lines and yard piping where proposed work crosses at a lower elevation.
    - 1) Stabilize excavation to prevent undermining of existing utility and yard piping.
2. Open trench outside buildings, units, and structures:
  - a. No more than 300 LF.
  - b. Field adjust limitations as weather conditions dictate.
3. Any trench or portion of trench, which is opened and remains idle for seven calendar days, or longer, as determined by the Owner, may be directed to be immediately refilled, without completion of work, at no additional cost to Owner.
  - a. Said trench may not be reopened until Owner is satisfied that work associated with trench will be prosecuted with dispatch.
4. Observe following trenching criteria:
  - a. Trench size:
    - 1) Excavate width to accommodate free working space.
    - 2) Maximum trench width at top of pipe or conduit may not exceed outside diameter of utility service by more than the following dimensions:

OVERALL DIAMETER OF UTILITY SERVICE	EXCESS DIMENSION
33 IN and less	18 IN
more than 33 IN	24 IN

- 3) Cut trench walls vertically from bottom of trench to 1 FT above top of pipe, conduit, or utility service.
- 4) Keep trenches free of surface water runoff.
  - a) Include cost in Bid.
  - b) No separate payment for surface water runoff pumping will be made.

E. Trenching for Electrical Installations:

1. Observe the preceding Trench Excavation paragraph in PART 3 of this Specification Section.
2. Modify for electrical installations as follows:
  - a. Open no more than 600 LF of trench in exterior locations for trenches more than 12 IN but not more than 30 IN wide.
  - b. Any length of trench may be opened in exterior locations for trenches which are 12 IN wide or less.
  - c. Do not over excavate trench.
  - d. Cut trenches for electrical runs with minimum 30 IN cover, unless otherwise specified or shown on Drawings.
  - e. See Division 26 for additional requirements.

F. CLSM/Flowable Fill:

1. Flowable fill shall be:

- a. Discharged from a mixer by any means acceptable to the Engineer into the area to be filled.
  - b. Placed in 4 FT maximum lifts to the elevations indicated.
    - 1) Allow 12 HR set-up time before placing next lift or as approved by the Engineer.
    - 2) Place flowable fill lifts in such a manner as to prevent flotation of the pipe.
  2. Flowable fill shall not be placed on frozen ground.
  3. Subgrade on which flowable fill is placed shall be free of disturbed or softened material and water.
  4. Flowable fill batching, mixing, and placing may be started if weather conditions are favorable, and the air temperature is 34 DEGF and rising.
  5. At the time of placement, flowable fill must have a temperature of at least 40 DEGF.
  6. Mixing and placing shall stop when the air temperature is 38 DEGF or less and falling.
  7. Each filling stage shall be as continuous an operation as is practicable.
  8. Prevent traffic contact with flowable fill for at least 24 HRS after placement or until flowable fill is hard enough to prevent rutting by construction equipment.
  9. Flowable fill shall not be placed until water has been controlled or groundwater level has been lowered in conformance with the requirements of the preceding Groundwater Dewatering paragraph in PART 3 of this Specification Section.
- G. Shoring:
1. Shore, slope, or brace excavations as required to prevent them from collapsing.
  2. Remove shoring as backfilling progresses but only when banks are stable and safe from caving or collapse.
  3. Construct shoring that is required to retain water as part of the dewatering system, using non-permeable details such as interlock sealant for sheet piles.

### **3.2 PREPARATION OF FOUNDATION FOR PIPE LAYING**

- A. Over-Excavation:
1. Backfill and compact to 90% of maximum dry density per ASTM D698.
  2. Backfill with granular bedding material as option.
- B. Rock Excavation:
1. Excavate minimum of 6 IN below bottom exterior surface of the pipe or conduit.
  2. Backfill to grade with suitable earth or granular material.
  3. Form bell holes in trench bottom.
- C. Subgrade Stabilization:
1. Stabilize the subgrade when directed by the Owner.
  2. Observe the following requirements when unstable trench bottom materials are encountered.
    - a. Notify Owner when unstable materials are encountered.
      - 1) Define by drawing station locations and limits.
    - b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
      - 1) Replace with subgrade stabilization with no additional compensation.

### **3.3 BACKFILLING METHODS**

- A. Do not backfill until tests to be performed on system show system is in full compliance with specified requirements.
- B. Carefully Compacted Backfill:
1. Furnish where indicated on Drawings, specified for trench embedment conditions and for compacted backfill conditions up to 12 IN above top of pipe or conduit.
  2. Comply with the following:
    - a. Place backfill in lifts not exceeding 8 IN (loose thickness).
    - b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
    - c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
    - d. Compact each lift to specified requirements.

- C. Common Trench Backfill:
  - 1. Perform in accordance with the following:
    - a. Place backfill in lift thicknesses capable of being compacted to densities specified.
    - b. Observe specific manufacturer's recommendations regarding backfilling and compaction.
    - c. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.
- D. Water flushing for consolidation is not permitted.
- E. Backfilling for Electrical Installations:
  - 1. Observe the preceding Carefully Compacted Backfill paragraph or Common Trench Backfill paragraph in PART 3 of this Specification Section or when approved by the Engineer.
  - 2. Modify for electrical installation as follows:
    - a. Observe notes and details on electrical drawings for fill in immediate vicinity of direct burial cables.

### 3.4 COMPACTION

- A. General:
  - 1. Place and assure bedding, backfill, and fill materials achieve an equal or higher degree of compaction than undisturbed materials adjacent to the work.
  - 2. In no case shall degree of compaction below minimum compactions specified be accepted.
- B. Compaction Requirements:
  - 1. Unless noted otherwise on Drawings or more stringently by other Specification Sections, comply with following minimum trench compaction criteria.
    - a. Bedding and Embedment material:

LOCATION	SOIL TYPE	COMPACTION DENSITY
All locations	Cohesionless soils	75% relative density by ASTM D4253 and ASTM D4254



b. Carefully compacted backfill:

LOCATION	SOIL TYPE	COMPACTION DENSITY
All applicable areas	Cohesive soils	95% of maximum dry density by ASTM D698
	Cohesionless soils	75% relative density by ASTM D4253 and ASTM D4254

c. Common trench backfill:

LOCATION	SOIL TYPE	COMPACTION DENSITY
Under pavements	Cohesive soils	95% of maximum dry density by ASTM D698
	Cohesionless soils	75% of relative density by ASTM D4253 and ASTM D4254

### 3.5 FIELD QUALITY CONTROL

- A. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA Standards, and state requirements. Where conflict between OSHA and state regulations exists, the more stringent requirements shall apply.
- B. Testing:
1. Perform in-place moisture-density tests as directed by the Owner.
  2. Perform tests through recognized testing laboratory approved by Owner.
  3. Costs of "Passing" tests paid by Owner.
  4. Perform additional tests as directed until compaction meets or exceeds requirements.
  5. Cost associated with "Failing" tests shall be paid by Contractor.
  6. Reference to Engineer in this Specification Section will imply Geotechnical Engineer when employed by Owner and directed by Engineer to undertake necessary inspections as approvals as necessary.
  7. Assure Owner has immediate access for testing of all soils related work.
  8. Ensure excavations are safe for testing personnel.

### END OF SECTION



**SECTION 32 12 16**  
**ASPHALTIC CONCRETE VEHICULAR PAVING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Asphaltic concrete vehicular paving.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Construction standards: State of California, Department of Transportation, "Caltrans 2018," as amended to date.
- B. Miscellaneous:
  - 1. Should conflicts arise between standard specifications of government agencies mentioned herein and Contract Documents, Contract Documents shall govern.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
  - 3. Asphalt design mix.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Asphaltic Concrete: Per Caltrans Section 39.
  - 1. Type A, 1/2 IN maximum aggregate size, medium gradation.
- B. Aggregate Base: Per Caltrans Section 26:
  - 1. Class 2, 3/4 IN maximum.
- C. Fog Seal: Per Caltrans Section 37.

**2.2 MIXES**

- A. Comply with mix design category, page 64-16, per Caltrans Section 92.

**PART 3 - EXECUTION**

**3.1 APPLICATION**

- A. Construct to line, grade and section as shown on Drawings and in accordance with referenced State Specifications.
- B. Install an 8 IN compacted layer of aggregate base course in accordance with Caltrans Section 26.
- C. Install asphaltic concrete, in accordance with Caltrans Section 39.

- D. Tolerance of Finished Grade: +0.10 FT from required elevations.
- E. Do not pave in wet weather or when rain is in the forecast.
- F. Place drip pans or absorbent material under paving equipment when not in use.
- G. Do not wash down fresh asphalt or concrete pavement.

**END OF SECTION**

**SECTION 40 05 00**  
**PIPE AND PIPE FITTINGS - BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Piping systems.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. American Association of State Highway and Transportation Officials (AASHTO):
  2. American Iron and Steel Institute (AISI).
  3. American Society of Mechanical Engineers (ASME):
    - a. B16.3, Malleable Iron Threaded Fittings.
    - b. B16.5, Pipe Flanges and Flanged Fittings.
    - c. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
    - d. B40.100, Pressure Gauges and Gauge Attachments.
  4. ASTM International (ASTM):
    - a. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - b. A106, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
    - c. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
    - d. A182, Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
    - e. A536, Standard Specification for Ductile Iron Castings.
    - f. A760, Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.
  5. American Water Works Association (AWWA):
    - a. B300, Standard for Hypochlorites.
    - b. C200, Standard for Steel Water Pipe - 6 IN and Larger.
    - c. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.
    - d. C208, Standard for Dimensions for Fabricated Steel Water Pipe Fittings.
    - e. C651, Standard for Disinfecting Water Mains.
    - f. C800, Standard for Underground Service Line Valves and Fittings.
  6. American Water Works Association/American National Standards Institute (AWWA/ANSI):
    - a. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings.
    - b. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
    - c. C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
    - d. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
    - e. C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
  7. Chlorine Institute, Inc. (CI):
    - a. Pamphlet 6, Piping Systems for Dry Chlorine.
  8. Underwriters Laboratories, Inc. (UL).
- B. Coordinate flange dimensions and drillings between piping, valves, and equipment.

### 1.3 DEFINITIONS

- A. HPIC: High performance industrial coating.

### 1.4 SYSTEM DESCRIPTION

- A. Piping Systems Organization and Definition:
  - 1. Piping services are grouped into designated systems according to the chemical and physical properties of the fluid conveyed, system pressure, piping size and system materials of construction.
  - 2. See PIPING SYSTEMS SCHEDULE in PART 3.

### 1.5 SUBMITTALS

- A. Shop Drawings:
  - 1. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Copies of manufacturer's written directions regarding material handling, delivery, storage and installation.
    - c. Separate schedule sheet for each piping system scheduled in this Specification Section showing compliance of all system components.
      - 1) Attach technical product data on gaskets, pipe, fittings, and other components.
  - 2. Fabrication and/or Layout Drawings:
    - a. Exterior yard piping drawings (minimum scale 1 IN equals 10 FT) with information including:
      - 1) Dimensions of piping lengths.
      - 2) Invert or centerline elevations of piping crossings.
      - 3) Acknowledgement of bury depth requirements.
      - 4) Details of fittings, tapping locations, thrust blocks, restrained joint segments, harnessed joint segments, hydrants, and related appurtenances.
      - 5) Acknowledge designated valve or gate tag numbers, manhole numbers, instrument tag numbers, pipe and line numbers.
      - 6) Line slopes and vents.
    - b. Interior piping drawings (minimum scale 1/8 IN equals 1 FT) with information including:
      - 1) Dimensions of piping from column lines or wall surfaces.
      - 2) Invert dimensions of piping.
      - 3) Centerline elevation and size of intersecting ductwork, conduit/conduit racks, or other potential interferences requiring coordination.
      - 4) Location and type of pipe supports and anchors.
      - 5) Locations of valves and valve actuator type.
      - 6) Details of fittings, tapping locations, equipment connections, flexible expansion joints, connections to equipment, and related appurtenances.
      - 7) Acknowledgement of valve, equipment and instrument tag numbers.
      - 8) Provisions for expansion and contraction.
      - 9) Line slopes and air release vents.
      - 10) Rough-in data for plumbing fixtures.
    - c. Schedule of interconnections to existing piping and method of connection.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
  - 1. Qualifications of lab performing disinfection analysis on water systems.
  - 2. Test reports:
    - a. Copies of pressure test results on all piping systems.
    - b. Reports defining results of dielectric testing and corrective action taken.

- c. Disinfection test report.
- d. Notification of time and date of piping pressure tests.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protect pipe coating during handling using methods recommended by manufacturer.
  - 1. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is not permitted.
- B. Prevent damage to pipe during transit.
  - 1. Repair abrasions, scars, and blemishes.
  - 2. If repair of satisfactory quality cannot be achieved, replace damaged material immediately.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Pipe saddles (for gage installation):
    - a. Dresser Style 91 (steel and ductile iron systems).
    - b. Dresser Style 194 (nonmetallic systems).
  - 2. Dismantling Joint
    - a. Romac DJ400.
    - b. Smith Blair 972.

### **2.2 PIPING SYSTEMS SCHEDULE**

- A. Piping system materials, fittings and appurtenances are subject to requirements of specific piping systems schedule located at the end of PART 3 of this Specification Section.

### **2.3 COMPONENTS AND ACCESSORIES**

- A. Reducers:
  - 1. Furnish appropriate size reducers and reducing fittings to mate pipe to equipment connections.
  - 2. Connection size requirements may change from those shown on Drawings depending on equipment furnished.
- B. Protective Coating and Lining:
  - 1. Include pipe, fittings, and appurtenances where coatings, linings, coating, tests and other items are specified.
  - 2. Field coating pipe in accordance with Specification Section 09 96 00.
- C. Underground Warning Tape:
  - 1. See Specification Section 10 14 00.
- D. Pressure Gages:
  - 1. See Specification Section 01 61 03 and Specification Section 40 91 10.
- E. Valves:
  - 1. See schematics and details for definition of manual valves used in each system under 4 IN in size.
    - a. See Drawings for valve types 4 IN and above and for automatic valves used in each system.
  - 2. See Specification Section 40 05 51.

## **PART 3 - EXECUTION**

### **3.1 EXTERIOR BURIED PIPING INSTALLATION**

- A. Enter and exit through structure walls, floors, and ceilings by using penetrations and seals specified in Specification Section 01 73 20 and as shown on Drawings.
- B. When entering or leaving structures with buried mechanical joint piping, install joint within 2 FT of point where pipe enters or leaves structure.
  - 1. Install second joint not more than 6 FT nor less than 4 FT from first joint.
- C. Install expansion devices as necessary to allow expansion and contraction movement.
- D. Laying Pipe In Trench:
  - 1. Excavate and backfill trench in accordance with Specification Section 31 23 33.
  - 2. Clean each pipe length thoroughly and inspect for compliance to specifications.
  - 3. Grade trench bottom and excavate for pipe bell and lay pipe on trench bottom.
  - 4. Install gasket or joint material according to manufacturer's directions after joints have been thoroughly cleaned and examined.
  - 5. Except for first two joints, before making final connections of joints, install two full sections of pipe with earth tamped alongside of pipe or final with bedding material placed.
  - 6. Lay pipe in only suitable weather with good trench conditions.
    - a. Never lay pipe in water except where approved by Engineer.
  - 7. Seal open end of line with watertight plug if pipe laying stopped.
  - 8. Remove water in trench before removal of plug.
- E. Anchorage and Blocking:
  - 1. Provide reaction blocking, anchors, joint harnesses, or other acceptable means for preventing movement of piping caused by forces in or on buried piping tees, wye branches, plugs, or bends. All piping shall be fully restrained.
- F. Install underground hazard warning tape per Specification Section 10 14 00.
- G. Install insulating components where dissimilar metals are joined together.

### **3.2 EXPOSED EXTERIOR PIPING INSTALLATION**

- A. Install piping in vertical and horizontal alignment as shown on Drawings.
- B. Alignment of piping smaller than 4 IN may not be shown; however, install according to Drawing intent and with clearance and allowance for:
  - 1. Expansion and contraction.
  - 2. System drainage and air removal.
- C. Enter and exit through structure walls, floor and ceilings using penetrations and seals specified in Specification Section 01 73 20 and as shown on the Drawings.
- D. Install vertical piping runs plumb and horizontal piping runs parallel with structure walls.
- E. Pipe Support:
  - 1. Use methods of piping support as shown on Drawings and as required in Specification Section 40 05 07.
  - 2. Where pipes run parallel and at same elevation or grade, they may be grouped and supported from common trapeze-type hanger, provided hanger rods are increased in size as specified for total supported weight.
    - a. The pipe in the group requiring the least maximum distance between supports shall set the distance between trapeze hangers.
  - 3. Size pipe supports with consideration to specific gravity of liquid being piped.
- F. Locate and size sleeves and castings required for piping system.
  - 1. Arrange for chases, recesses, inserts or anchors at proper elevation and location.



- G. Use reducing fittings throughout piping systems.
  - 1. Bushings will not be allowed unless specifically approved.
- H. Unions:
  - 1. Install in position which will permit valve or equipment to be removed without dismantling adjacent piping.
  - 2. Mechanical type couplings may serve as unions.
  - 3. Additional flange unions are not required at flanged connections.
- I. Install expansion devices as necessary to allow expansion/contraction movement.
- J. Provide full face gaskets on all systems.
- K. Anchorage and Blocking:
  - 1. Block, anchor, or harness exposed piping subjected to forces in which joints are installed to prevent separation of joints and transmission of stress into equipment or structural components not designed to resist those stresses.
- L. Equipment Pipe Connections:
  - 1. Equipment - General:
    - a. Exercise care in bolting flanged joints so that there is no restraint on the opposite end of pipe or fitting which would prevent uniform gasket pressure at connection or would cause unnecessary stresses to be transmitted to equipment flanges.
    - b. Where push-on joints are used in conjunction with flanged joints, final positioning of push-on joints shall not be made until flange joints have been tightened without strain.
    - c. Tighten flange bolts at uniform rate which will result in uniform gasket compression over entire area of joint.
      - 1) Provide tightening torque in accordance with manufacturer's recommendations.
    - d. Support and match flange faces to uniform contact over their entire face area prior to installation of any bolt between the piping flange and equipment connecting flange.
    - e. Permit piping connected to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.
    - f. Align, level, and wedge equipment into place during fitting and alignment of connecting piping.
    - g. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.
    - h. To provide maximum flexibility and ease of alignment, assemble connecting piping with gaskets in place and minimum of four bolts per joint installed and tightened.
      - 1) Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange.
      - 2) Realign as necessary, install flange bolts and make equipment connection.
    - i. Provide utility connections to equipment shown on Drawings, scheduled or specified.
- M. Provide insulating components where dissimilar metals are joined together.

### **3.3 CONNECTIONS WITH EXISTING PIPING**

- A. Where connection between new work and existing work is made, use suitable and proper fittings to suit conditions encountered.
- B. Perform connections with existing piping at time and under conditions which will least interfere with service to customers affected by such operation.
- C. Undertake connections in fashion which will disturb system as little as possible.
- D. Provide suitable equipment and facilities to dewater, drain, and dispose of liquid removed without damage to adjacent property.
- E. Where connections to existing systems necessitate employment of past installation methods not currently part of trade practice, utilize necessary special piping components.

- F. Where connection involves potable water systems, provide disinfection methods as prescribed in this Specification Section.
- G. Once tie-in to each existing system is initiated, continue work continuously until tie-in is made and tested.

### 3.4 PRESSURE GAGES

- A. Provide at locations shown on the Drawings and specified.
- B. See Specification Section 01 61 03.

### 3.5 FIELD QUALITY CONTROL

- A. Pipe Testing - General:
  - 1. Test piping systems as follows:
    - a. Test exposed, non-insulated piping systems upon completion of system.
    - b. Test buried piping (insulated and non-insulated) prior to backfilling and, if insulated, prior to application of insulation.
  - 2. Isolate equipment which may be damaged by the specified pressure test conditions.
  - 3. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring equipment to determine leakage rates.
    - a. Select each gage so that the specified test pressure falls within the upper half of the gage's range.
    - b. Notify the Engineer 24 HRS prior to each test.
  - 4. Completely assemble and test new piping systems prior to connection to existing pipe systems.
  - 5. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance.
  - 6. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.
- B. Pressure Testing:
  - 1. Testing medium: Unless otherwise specified in the PIPING SYSTEMS SCHEDULE, utilize the following test media.
    - a. Liquid systems:

PIPE LINE SIZE (DIA)	GRAVITY OR PUMPED	SPECIFIED TEST PRESSURE	TESTING MEDIUM
Up to and including 48 IN	Gravity	25 PSIG or less	Water
All sizes	Pumped	250 PSIG or less	Water

- 2. Allowable leakage rates:
  - a. Hazardous gas systems, all exposed piping systems, all pressure piping systems and all buried, insulated piping systems which are hydrostatically pressure tested shall have zero leakage goal at the specified test pressure throughout the duration of the test.
- 3. Hydrostatic pressure testing methodology:
  - a. General:
    - 1) All joints, including welds, are to be left exposed for examination during the test.
    - 2) Provide additional temporary supports for piping systems designed for vapor or gas to support the weight of the test water.
    - 3) Provide temporary restraints for expansion joints for additional pressure load under test.
    - 4) Isolate equipment in piping system with rated pressure lower than pipe test pressure.
    - 5) Do not coat or insulate exposed piping until successful performance of pressure test.

- b. Larger diameter (above 36 IN) gravity plant piping:
  - 1) Plug downstream end of segment to be tested.
    - a) Provide bracing as required.
  - 2) Fill segment and upstream structure to normal operating level as per hydraulic profile.
  - 3) Allow 24 HRS for absorption losses.
    - a) Refill to original level.
  - 4) Provide reservoir to maintain constant head over duration of test.
  - 5) Record reservoir water volume at beginning and end of test.

### **3.6 CLEANING, DISINFECTION AND PURGING**

- A. Cleaning:
  - 1. Clean interior of piping systems thoroughly before installing.
  - 2. Maintain pipe in clean condition during installation.
  - 3. Before jointing piping, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
  - 4. At completion of work and prior to Final Acceptance, thoroughly clean work installed under these Specifications.
    - a. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sludge which may have accumulated by operation of system, from testing, or from other causes.
    - b. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner.
- B. Disinfection (for RBW system):
  - 1. After favorable performance of pressure test and prior to Final Acceptance, thoroughly flush entire piping system including supply, source and any appurtenant devices and perform disinfection as prescribed.
  - 2. Perform work, including preventative measures during construction, in full compliance with AWWA C651.
  - 3. Perform disinfection using sodium hypochlorite complying with AWWA B300.
  - 4. Flush each segment of system to provide flushing velocity of not less than 2.5 FT per second.
  - 5. Drain flushing water to sanitary sewer.
    - a. Do not drain flushing water to receiving stream.
  - 6. Use continuous feed method of application.
    - a. Tag system during disinfection procedure to prevent use.
  - 7. After required contact period, flush system to remove traces of heavily chlorinated water.
  - 8. After final flushing and before placing water in service, obtain an independent laboratory approved by the Owner to collect samples and test for bacteriological quality.
    - a. Repeat entire disinfection procedures until satisfactory results are obtained.
  - 9. Secure and deliver to Owner, satisfactory bacteriological reports on samples taken from system.
    - a. Ensure sampling and testing procedures are in full compliance to AWWA C651, local water purveyor and applicable requirements of State of California.

### **3.7 LOCATION OF BURIED OBSTACLES**

- A. Furnish exact location and description of buried utilities encountered and thrust block placement.
- B. Reference items to definitive reference point locations such as found property corners, entrances to buildings, existing structure lines, fire hydrants and related fixed structures.
- C. Include such information as location, elevation, coverage, supports and additional pertinent information.
- D. Incorporate information on "As-Recorded" Drawings.

### 3.8 PIPING SYSTEM SCHEDULES

#### A. Piping System 1

1. General:
  - a. All materials used for this system shall be NSF 61 certified.
  - b. Piping symbol and service:
    - 1) RBW – Reclaimed Backwash Water.
  - c. Test requirements:
    - 1) Test medium: Water.
    - 2) Pressure: 1.25 x working pressure.
    - 3) Duration: 6 HRS.
  - d. Gaskets:
    - 1) Flanged, restrained push-on and restrained mechanical joints (ductile iron): Rubber, AWWA/ANSI C111/A21.11.
    - 2) Flanged joints (steel): AWWA C207.
2. System components:
  - a. Pipe size 3 IN through 24 IN:
    - 1) Exposed service:
      - a) Material:
        - (1) Flanged: Ductile iron, Class 53.
      - b) Reference: AWWA/ANSI C115/A21.15.
      - c) Lining: Cement.
      - d) Coating: HPIC; See Specification Section 09 96 00.
      - e) Fittings: Either AWWA/ANSI C110/A21.10 ductile or gray iron.
      - f) Joints:
        - (1) Flanged or otherwise fully restrained without exceptions.
    - 2) Buried service:
      - a) Materials: Ductile iron, Class 53.
      - b) Reference: AWWA/ANSI C151/A21.51.
      - c) Lining: Cement.
      - d) Coating: Bituminous and double wrapped in 8 mil polyethylene encasement.
      - e) Fittings:
        - (1) Either AWWA/ANSI C110/A21.10 ductile or gray iron.
        - (2) Optional: AWWA/ANSI C153/A21.53 ductile iron compact fittings for sizes 3 IN to 16 IN.
      - f) Joints: Flanged or otherwise fully restrained without exceptions.
  - b. Pipe size greater than 24 IN:
    - 1) Buried and submerged service:
      - a) Material: Steel, fabricated pipe.
      - b) Reference: AWWA C200.
      - c) Lining: Cement.
      - d) Coating: Cement and double wrapped in 8 mil polyethylene encasement.
      - e) Fittings: AWWA C208.
      - f) Joints: Flanged, butt welded, or otherwise fully restrained without any exceptions.

#### B. Specification Schedule – System 2

1. General:
  - a. Piping symbol and service:
    - 1) Sample - Raw water sample.
  - b. Test requirements:
    - 1) Test medium: Water.
    - 2) Pressure: 1.25 x working pressure.
    - 3) Duration: 6 HRS.
  - c. Gaskets and O-rings:
    - 1) Viton.

2. System components:
  - a. Pipe size 12 IN and smaller:
    - 1) Buried service:
      - a) Material: PVC, Type 1, Grade 1, Schedule 40.
      - b) Reference: ASTM D1785.
      - c) Lining: None.
      - d) Coating: Double wrapped in 8 mil polyethylene encasement.
      - e) Fittings: Solvent welded socket type complying with ASTM D2466.
      - f) Joints:

**END OF SECTION**



**SECTION 40 05 07**  
**PIPE SUPPORT SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pipe support and anchor systems.
  - 2. Design of Pipe Support Systems as specified.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. B31.1, Power Piping.
    - b. B31.3, Process Piping.
  - 2. ANVIL International (ANVIL).
  - 3. ASTM International (ASTM):
    - a. A36, Standard Specification for Carbon Structural Steel.
    - b. A276, Standard Specification for Stainless Steel Bars and Shapes.
    - c. A575, Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
    - d. A576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
    - e. A917, Standard Specification for Steel Sheet, Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface (General Requirements).
    - f. A918, Standard Specification for Steel Sheet, Zinc-Nickel Alloy Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
    - g. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
  - 4. American Welding Society (AWS):
    - a. D1.1, Structural Welding Code - Steel.
  - 5. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
    - a. SP-58, Pipe Hangers and Supports - Materials, Design and Manufacture.
    - b. SP-69, Pipe Hangers and Supports - Selection and Application.
- B. Responsibility:
  - 1. Design complete support systems for piping 12 IN and smaller.
  - 2. Provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install the system of hangers, supports, guidance, anchorage and appurtenances.
  - 3. General piping support details may be indicated on the Drawings in certain locations for pipe 12 IN DIA and smaller.
  - 4. Incorporate those details with requirements of this Specification Section to provide the piping support system.
- C. Each type of pipe hanger or support shall be the product of one manufacturer.
- D. Qualifications:
  - 1. Pipe support designer:
    - a. Licensed Professional Engineer registered in the state the project is located in.
    - b. Minimum of 5 years experience designing pipe supports for projects of similar size and complexity.

**1.3 SUBMITTALS**

- A. Shop Drawings:

1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Manufacturer's installation instructions.
  - c. Itemized list of wall sleeves, anchors, support devices and all other items related to pipe support system.
  - d. Scaled drawings showing location, installation, material, loads and forces, and deflection of all hangers and supports.
  - e. Analyze each pipe system for all loads and forces on hangers and supports and their reaction forces to the structure to which they are fastened.
  - f. Where Contract Documents indicate contractor is to design pipe support systems, submit detail design calculations and scaled drawings signed by Pipe support designer..
3. Certifications.
  - a. Pipe support designer qualifications

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.
- B. Submit request for substitution in accordance with General Provisions Article 5.

### **2.2 MANUFACTURED UNITS**

- A. Vertical Pipe Supports:
  1. At base of riser.
  2. Lateral movement:
    - a. Clamps or brackets:
      - 1) Stainless steel 316.
- B. Pipe Support Saddle:
  1. For pipe located 3 FT or less from floor elevation, except as otherwise indicated on Drawings.
  2. Stainless steel.
- C. Pipe Support Risers:
  1. Schedule 40 pipe.
  2. Stainless steel.
  3. Size: As recommended by saddle manufacturer.
- D. Pipe Support Base Plate:
  1. 4 IN larger than support.
  2. Collar 3/16 IN thickness, circular in shape, and sleeve type connection to pipe.
  3. Collar fitted over outside of support pipe and extended 2 IN from floor plate.
  4. Collar welded to floor plate.
  5. Edges ground smooth.
  6. Assembly hot-dipped galvanized after fabrication.
  7. Stainless steel.
- E. Wall Brackets:
  1. For pipe located near walls and 8 FT or more above floor elevation or as otherwise indicated on the Drawings.
  2. Stainless steel.
- F. Pipe Anchors:
  1. For locations shown on the Drawings.
  2. 1/4 IN steel plate construction.



3. Stainless steel.
4. Designed to prevent movement of pipe at point of attachment.

## 2.3 DESIGN REQUIREMENTS

- A. Supports capable of supporting the pipe for all service and testing conditions.
  1. Provide 4 to 1 safety factor.
- B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.
- C. Design supports and hangers to allow for proper pitch of pipes.
- D. Check all physical clearances between piping, support system and structure.
  1. Provide for vertical adjustment after erection.
- E. Support vertical pipe runs at base of riser.
  1. Support pipes for lateral movement with clamps or brackets.
- F. Pipe Support Spacing:
  1. General:
    - a. Factor loads by specific weight of liquid conveyed if specific weight is greater than water.
    - b. Locate pipe supports at maximum spacing scheduled unless indicated otherwise on the Drawings.
    - c. Provide at least one (1) support for each length of pipe at each change of direction and at each valve.
  2. Steel, stainless steel, ductile iron, support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
1-1/2 and less	5
2 thru 4	10
5 thru 8	15
10 and greater	20

3. Support each length and every fitting:
  - a. Bell and spigot piping:
    - 1) At least one (1) hanger.
    - 2) Applied at bell.
  - b. Mechanical coupling joints:
    - 1) Place hanger within 2 FT of each side of fittings to keep pipes in alignment.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Provide piping systems exhibiting pulsation, vibration, swaying, or impact with suitable constraints to correct the condition.
  1. Included in this requirement are movements from:
    - a. Trap discharge.
    - b. Water hammer.
    - c. Similar internal forces.
- B. Weld Supports:
  1. AWS D1.1.
  2. Weld anchors to pipe in accordance with ASME B31.3.

- C. Locate piping and pipe supports as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.
- D. Inspect hangers for:
  - 1. Design offset.
  - 2. Adequacy of clearance for piping and supports in the hot and cold positions.
  - 3. Guides to permit movement without binding.
  - 4. Adequacy of anchors.
- E. Inspect hangers after erection of piping systems and prior to pipe testing and flushing.
- F. Anchorage to Concrete- reference Section 03 15 19.
- G. Welding:
  - 1. Welding rods: ASTM and AWS standards.
  - 2. Integral attachments:
    - a. Include welded-on ears, shoes, plates and angle clips.
    - b. Ensure material for integral attachments is of good weldable quality.
  - 3. Preheating, welding and postheat treating: ASME B31.3, Chapter V.
- H. Field Painting:
  - 1. Comply with Specification Section 09 96 00.

**END OF SECTION**

**SECTION 40 05 19**  
**PIPE - DUCTILE IRON**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Ductile iron piping, fittings, and appurtenances.
- B. Related Sections include but are not necessarily limited to:
  - 1. Section 40 05 00 - Pipe and Pipe Fittings: Basic Requirements.

**1.2 REFERENCE**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. B1.1, Unified Inch Screw Threads (UN and UNR Thread Form).
    - b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
  - 2. ASTM International (ASTM):
    - a. B695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
  - 3. American Water Works Association (AWWA):
    - a. C203, Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
    - b. C217, Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe.
    - c. C606, Standard for Grooved and Shouldered Joints.
  - 4. American Water Works Association/American National Standards Institute (AWWA/ANSI):
    - a. C105/A21.5, Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
    - b. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings.
    - c. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
    - d. C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
    - e. C150/A21.50, Standard for Thickness Design of Ductile-Iron Pipe.
    - f. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. Comply with Section 40 05 00 - Pipe - Basic Requirements.
  - 2. Certification of factory hydrostatic testing.
  - 3. If mechanical coupling system is used, submit piping, fittings, and appurtenant items which will be utilized to meet system requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Flanged Adaptors (flanged coupling adaptors):
    - Smith Blair.
    - a. Dresser.

2. Mechanical coupling:
  - a. Victaulic, Style 31.
  - b. Tyler.
3. Polyethylene Encasement Tape:
  - a. Chase, Chasekote 750.
  - b. Kendall, Polyken 900.
  - c. 3 M, Scotchrap 50.
4. Restrained joints:
  - a. Series 1100 MEGALUG.
  - b. American (Lock Fast) - 12 IN and below.
  - c. U.S. Pipe (TR-Flex) - 4 IN to 54 IN.
  - d. American (Lock Fast) - Above 12 IN.

## 2.2 MATERIALS

- A. Ductile Iron Pipe:
  1. AWWA/ANSI C115/A21.15.
  2. AWWA/ANSI C150/A21.50.
  3. AWWA/ANSI C151/A21.51.
- B. Fittings and Flanges:
  1. AWWA/ANSI C110/A21.10.
  2. AWWA/ANSI C115/A21.15.
  3. Flanges drilled and faced per ASME B16.1 for both 125 and 250 PSI applications.
- C. Nuts and Bolts:
  1. Buried: Type 316 Stainless Steel.
  2. Exposed: Type 316 Stainless Steel.
  3. Heads and dimensions per ASME B1.1.
  4. Threaded per ASME B1.1.
  5. Project ends 1/4 to 1/2 IN beyond nuts.
- D. Gaskets: See individual piping system requirements in Section 40 05 00.
- E. If mechanical coupling system is used, utilize pipe thickness and grade in accordance with AWWA C606.
- F. Polyethylene Encasement: See AWWA/ANSI C105/A21.5.
- G. See Piping Schedules in Section 40 05 00.

## 2.3 MANUFACTURED UNITS

- A. Couplings:
  1. Flanged adaptors:
    - a. Unit consisting of steel or carbon steel body sleeve, flange, followers, Grade 30 rubber gaskets.
    - b. Provide units specified in the MANUFACTURERS Article.
    - c. Supply flanges meeting standards of adjoining flanges.
    - d. Rate entire assembly for test pressure specified on piping schedule for each respective application.
  2. Mechanical couplings:
    - a. Use of mechanical couplings and fittings in lieu of flanged joints is acceptable where specifically specified in Section 40 05 00.
    - b. Utilize units defined in the MANUFACTURERS Article.
    - c. Couplings shall be fully restrained.

## 2.4 FABRICATION

- A. Furnish and install without outside coatings of bituminous material any exposed pipe scheduled to be painted.

- B. Furnish cast parts with lacquer finish compatible with finish coat.

## **2.5 LININGS AND COATINGS**

- A. Where specified in piping schedule, provide linings to a minimum thickness of 40 MILS.

## **2.6 SOURCE QUALITY CONTROL**

- A. Factory Test:
  - 1. Subject pipe to hydrostatic test of not less than 500 PSI with the pipe under the full test pressure for at least 10 seconds.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. Joining Method - Flanged Joints:
  - 1. Install in accordance with AWWA/ANSI C115/A21.15.
  - 2. Extend pipe completely through screwed-on flanged and machine flange face and pipe in single operation.
  - 3. Make flange faces flat and perpendicular to pipe centerline.
  - 4. When bolting flange joints, exercise extreme care to ensure that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress, bending or torsional strains to be applied to cast flanges or flanged fittings.
  - 5. Allow one flange free movement in any direction while bolts are being tightened.
  - 6. Do not assemble adjoining flexible joints until flanged joints in piping system have been tightened.
  - 7. Gradually tighten flange bolts uniformly to permit even gasket compression.
- B. Joining Method - Mechanical Coupling Joint:
  - 1. Arrange piping so that pipe ends are in full contact.
  - 2. Groove and shoulder ends of piping in accordance with manufacturer's recommendations.
  - 3. Provide coupling and grooving technique assuring a connection which passes pressure testing requirements.
- C. Flange Adaptors 12 IN and Less:
  - 1. Locate and drill holes for anchor studs after pipe is in place and bolted tight.
  - 2. Drill holes not more than 1/8 IN larger than diameter of stud projection.
- D. Cutting:
  - 1. Do not damage interior lining material during cutting.
  - 2. Use abrasive wheel cutters or saws.
  - 3. Make square cuts.
  - 4. Bevel and free cut ends of sharp edges after cutting.
- E. Support exposed pipe in accordance with Section 40 05 00.
- F. Install buried piping in accordance with Section 40 05 00.
- G. Install restrained joint systems where specified in Section 40 05 00 under specific piping system.

## **3.2 FIELD QUALITY CONTROL**

- A. Test piping systems in accordance with Section 40 05 00.

## **END OF SECTION**



## **SECTION 40 05 24**

### **PIPE - STEEL**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Steel pipe, fittings, and appurtenances.
- B. Related Sections include but are not necessarily limited to:
  - 1. Section 09 96 00 - High Performance Industrial Coatings.
  - 2. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.

##### **1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. B1.1, Unified Inch Screw Threads (UN and UNR Thread Form).
    - b. B1.2, Gages and Gaging for Unified Inch Screw Threads.
    - c. B16.3, Malleable Iron Threaded Fittings.
    - d. B16.5, Pipe Flanges and Flanged Fittings.
    - e. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
    - f. B16.11, Forged Steel Fittings, Socket Welding and Threaded.
    - g. B31.1, Power Piping.
    - h. B31.3, Process Piping.
    - i. B31.9, Building Services Piping.
    - j. Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
  - 2. ASTM International (ASTM):
    - a. A36, Standard Specification for Carbon Structural Steel.
    - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
    - c. A181, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
    - d. A234, Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
    - e. A283, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
    - f. A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
    - g. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
    - h. B6, Standard Specification for Zinc.
  - 3. American Water Works Association (AWWA):
    - a. C200, Standard for Steel Water Pipe - 6 IN and Larger.
    - b. C203, Standard for Coal-Tar Protective Coatings and Linings for Steel water Pipeline - Enamel and Tape - Hot Applied.
    - c. C205, Standard for Cement-Mortar Lining and Coating for Steel Water Pipe - 4 IN and Larger - Shop Applied.
    - d. C206, Standard for Field Welding of Steel Water Pipe.
    - e. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.
    - f. C208, Standard for Dimensions for Fabricated Steel Water Pipe Fittings.
    - g. C209, Standard for Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.

- h. C210, Standard for Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
    - i. C606, Standard for Grooved and Shouldered Joints.
    - j. M11, Steel Pipe - A Guide for Design and Installation.
  - 4. Society of Automotive Engineers (SAE):
    - a. AMS-QQ-P-416, Cadmium Plating Electro deposited.
- B. Qualifications:
  - 1. Application of coal tar lining and coating materials including preparation of surfaces, priming, and lining and coating of pipe, fittings, and specials, in shop, repairs of any damage to lining or coating occurring during shipment or any other time, and field lining and coating of ends where linings or coatings have been held back for welded field joints, shall be done by established and recognized pipe company acceptable to Engineer.
  - 2. Use only certified welders meeting procedures and performance outlined in ASME Section IX, AWWA C200 Section 3.3.3 and other codes and requirements per local building and utility requirements.

### **1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Specification Section 40 05 00.
  - 2. Factory test reports.
  - 3. If mechanical grooved type coupling system is used, submit piping, fittings, and appurtenant items which will be utilized.
  - 4. Coating manufacturer's qualifications.
  - 5. Welders certificates.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. All materials used in steel piping systems defined in Section 40 05 00 shall meet or exceed pressure test requirements specified for each respective system.
- B. Steel Pipe (Fabricated Type):
  - 1. AWWA C200:
    - a. ASTM A36, Grade C steel plate.
    - b. ASTM A283, Grade D steel plate.
    - c. ASTM A572, steel plate.
    - d. ASTM A1011, steel sheet.
- C. Fittings (For Fabricated Pipe): AWWA C208.
- D. Flanges (Fabricated Pipe):
  - 1. Flange material: ASTM A283, Grade C or D, ASTM A181, Grade 1.
  - 2. Flange finish: Flat faced.
- E. Nuts and Bolts:
  - 1. Heads and dimensions per ASME B1.1.
  - 2. Threaded per ASME B1.1.
  - 3. Project ends 1/4 to 1/2 IN beyond nuts.

### **2.2 FABRICATION**

- A. Provide piping (mill or fabricated) for use in this Project with minimum wall thicknesses as follows:
  - 1. 16 - 48 IN DIA pipe: 5/16 IN.
  - 2. Sizes through 24 IN are nominal ID.
    - a. Sizes greater than 24 are ID.
      - 1) Contractor must verify size of existing pipe to be tied into.



3. Wall thicknesses indicated are for standard weight pipe.
  - a. Design pipe in accordance with operating pressures shown in Piping Schedules for a design stress limited to 50% of yield.
- B. Furnish cast parts with lacquer finish compatible with finish coating.
- C. Furnish without outside coating of bituminous material any exposed pipe scheduled to be painted.
- D. Fabricated Fittings:
  1. AWWA C208.
  2. Assure ratio of radius of bend to diameter of pipe equal to or greater than 1.0.
- E. Taper cement mortar linings as required for valve interfacing.
  1. Provide cement mortar lining in accordance with AWWA C205.
  2. Provide cement mortar coating in accordance with AWWA C205.

## 2.3 SOURCE QUALITY CONTROL

- A. Testing:
  1. Shop hydrostatic test fabricated steel pipe and fittings.
  2. Field hydrostatic test all pipe as specified in Section 40 05 00.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Joining Methods - Flanges:
  1. Facing method:
    - a. Insert slip-on flange on pipe.
    - b. Assure maximum tolerances for flange faces from normal with respect to axis of pipe is 0.005 IN per foot of flange diameter.
    - c. Test flanges after welding to pipe for true to face condition and reface, if necessary, to bring to specified tolerance.
  2. Joining method:
    - a. Leave 1/8 to 3/8 IN of flange bolts projecting beyond face of nut after tightening.
    - b. Coordinate dimensions and drillings of flanges with flanges for valves, pumps, equipment, tank, and other interconnecting piping systems.
    - c. When bolting flange joints, exercise extreme care to assure that there is no restraint on opposite end of pipe or fitting which would prevent uniform gasket compression or cause unnecessary stress, bending or torsional strains being applied to cast flanges or flanged fittings.
      - 1) Allow one flange free movement in any direction while bolts are being tightened.
    - d. Do not assemble adjoining flexible coupled, mechanical coupled or welded joints until flanged joints in piping system have been tightened.
    - e. Gradually tighten flange bolts uniformly to permit even gasket compression.
    - f. Do not overstress bolts to compensate for poor installation.
- C. Joining Method - Welded Joints:
  1. Perform welding in accordance with AWWA C206 and this Section.
  2. For flange attachment perform in accordance with AWWA C207.
  3. Have each welding operator affix an assigned symbol to all his welds.
    - a. Mark each longitudinal joint at the extent of each operator's welding.
    - b. Mark each circumferential joint, nozzle, or other weld into places 180 DEG apart.
  4. Welding for all process piping shall conform to ASME B31.3.
    - a. Welding of utility piping 125 PSI and less shall be welded per ASME B31.9.
    - b. Utility piping above 125 PSI shall conform to ASME B31.1.
  5. Provide caps, tees, elbows, reducers, etc., manufactured for welded applications.

6. Weldolets may be used for 5 IN and larger pipe provided all slag is removed from inside the pipe.
7. Weld-in nozzles may be used for branch connections to mains and where approved by Engineer.
8. Use all long radius welding elbows for expansion loops and bends.
9. Use long radius reducing welding elbows 90 DEG bends and size changes are required.

### **3.2 FIELD QUALITY CONTROL**

- A. Test piping systems in accordance with Section 40 05 00.

**END OF SECTION**

**SECTION 40 05 51**  
**VALVES - BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Valving, actuators, and valving appurtenances.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
1. American Society of Mechanical Engineers (ASME):
    - a. B1.20.1, Pipe Threads, General Purpose.
    - b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
    - c. B16.34, Valves-Flanged, Threaded and Welding End.
  2. ASTM International (ASTM):
    - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
    - b. D638, Standard Test Method for Tensile Properties of Plastics.
    - c. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
    - d. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
    - e. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
  3. American Water Works Association (AWWA):
    - a. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.
    - b. C542, Standard for Electric Motor Actuators for Valves and slide Gates.
    - c. C550, Standard for Protective Coatings for Valves and Hydrants.
    - d. C606, Standard for Grooved and Shouldered Joints.
  4. American Water Works Association/American National Standards Institute (AWWA/ANSI).
  5. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. MG 1, Motors and Generators.
  6. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  7. National Sanitation Foundation International (NSF):
    - a. 61, Drinking Water System Components - Health Effects.

**1.3 DEFINITIONS**

- A. The following are definitions of abbreviations used in this Specification Section or one (1) of the individual valve sections:
1. WWP: Water working pressure.

**1.4 SUBMITTALS**

- A. Shop Drawings:
1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  2. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
    - c. Valve pressure and temperature rating.
    - d. Valve material of construction.

- e. Special linings.
  - f. Valve dimensions and weight.
  - g. Valve flow coefficient.
  - h. Wiring and control diagrams for electric or cylinder actuators.
  - i. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations per Section 01 61 03.
- 3. Test reports.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provision Article 18 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
  - 1. Verification from valve actuator manufacturer that actuators have been installed properly, that all limit switches and position potentiometers have been properly adjusted, and that the valve actuator responds correctly to the valve position command.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, refer to individual valve Specification Sections for acceptable manufacturers.

### **2.2 MATERIALS**

- A. Refer to individual valve Specification Sections.

### **2.3 VALVE ACTUATORS**

- A. Valve Actuators - General:
  - 1. Provide actuators as shown on Drawings or specified.
  - 2. Counter clockwise opening as viewed from the top.
  - 3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
  - 4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum pressure rating of the valve provided and withstand without damage a pull of 200 LB on handwheel or chainwheel or 300 FT-pounds torque on the operating nut.
  - 5. Unless otherwise specified, actuators for valves to be buried, submerged or installed in vaults or manholes shall be sealed to withstand at least 20 FT of submergence.
  - 6. Extension stem:
    - a. Install where shown or specified.
    - b. Solid steel with actuator key and nut, diameter not less than stem of valve actuator shaft.
    - c. Pin all stem connections.
    - d. Center in valve box or grating opening band with guide bushing.
- B. Exposed Valve Manual Actuators:
  - 1. Provide for all exposed valves not having electric or cylinder actuators.
  - 2. Provide lever actuators for ball valves 3 IN DIA and smaller.
    - a. Lever actuators for butterfly valves shall have a minimum of 5 intermediate lock positions between full open and full close.
    - b. Provide at least two (2) levers for each type and size of valve furnished.
  - 3. Gear actuators to be totally enclosed, permanently lubricated and with sealed bearings.
  - 4. Provide chain actuators for valves 6 FT or higher from finish floor to valve centerline.
    - a. Stainless steel chain looped to within 3 FT of finish floor.
    - b. Equip chain wheels with chain guides to permit rapid operation with reasonable side pull without "gagging" the wheel.

- c. For smaller valves with lever or handle operators, provide offset tee handles with attached chain for operation from the operating floor.
- C. Buried Valve Actuators:
  - 1. Provide screw or slide type adjustable cast iron valve box, 5 IN minimum diameter, 3/16 IN minimum thickness, and identifying cast iron cover rated for traffic load.
  - 2. Box base to enclose buried valve gear box or bonnet.
  - 3. Provide 2 IN standard actuator nuts complying with AWWA C500, Section 3.16.
  - 4. Provide at least two tee handle keys for actuator nuts, with 5 FT extension between key and handle.
  - 5. Extension stem:
    - a. Provide for buried valves greater than 4 FT below finish grade.
    - b. Extend to within 6 IN of finish grade.
  - 6. Provide concrete pad encasement of valve box as shown for all buried valves unless shown otherwise.
- D. Valve Lockout Devices:
  - 1. Device manufactured from same material as valve operator, preventing access to valve operator, to accept lock shackle.

## 2.4 FABRICATION

- A. End Connections:
  - 1. Provide the type of end connections for valves as required in the Piping Schedules presented in Section 40 05 00 or as shown on the Drawings.
  - 2. Comply with the following standards:
    - a. Threaded: ASME B1.20.1.
    - b. Flanged: ASME B16.1, Class 125 unless otherwise noted or AWWA C207.
    - c. Bell and spigot or mechanical (gland) type: AWWA/ANSI C111/A21.11.
    - d. Soldered: ASME B16.18.
    - e. Grooved: Rigid joints per Table 5 of AWWA C606.
- B. Refer to individual valve Specification Sections for specifications of each type of valve used on Project.
- C. Nuts, Bolts, and Washers:
  - 1. Wetted or internal to be stainless steel.
    - a. Exposed to be stainless steel.
- D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.
- E. Epoxy Interior Coating: Provide NSF-61 certified epoxy interior coating for all ferrous surfaces.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Painting Requirements: Comply with Section 09 96 00 for High Performance Industrial Coatings.
- C. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.
- D. Setting Buried Valves:
  - 1. Locate valves installed in pipe trenches where buried pipe indicated on Drawings.
  - 2. Set valves and valve boxes plumb.
  - 3. Place valve boxes directly over valves with top of box being brought to surface of finished grade.

4. Install in closed position.
  5. Place valve on firm footing in trench to prevent settling and excessive strain on connection to pipe.
  6. After installation, backfill up to top of box for a minimum distance of 4 FT on each side of box.
- E. Install valves accessible for operation, inspection, and maintenance.

### **3.2 ADJUSTMENT**

- A. Adjust valves, actuators and appurtenant equipment to optimize performance.
1. Operate valve, open and close at system pressures.

**END OF SECTION**

**SECTION 40 05 52**  
**MISCELLANEOUS VALVES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Air release valves.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Section 01 61 03 - Equipment - Basic Requirements.
  - 2. Section 40 05 51 - Valves - Basic Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
  - 2. American Water Works Association (AWWA):
    - a. C512, Standard for Air-Release, Air-Vacuum, and Combination Air Valves for Waterworks Service.
    - b. C550, Standard for Protective Interior Coatings for Valves and Hydrants.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Specification Section 40 05 51.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

**2.2 AIR RELEASE VALVES (CLEAN WATER)**

- A. General: Conform to AWWA C512.
  - 1. Water:
    - a. Combination Air Release and Vacuum Valve:
      - 1) Acceptable manufacturer:
        - a) APCO.
        - b) GA Industries.
        - c) Vent-O-Mat.
      - 2) Materials:
        - a) Top and lower flange: NSF-61 certified epoxy coating.
        - b) Barrel: 316 stainless steel.
        - c) Floats: 316 stainless steel.
        - d) Float seats and seals: EPDM.
        - e) All wetted internal metal parts: 316 stainless steel.
    - b. Design requirements:
      - 1) NSF-61 Certified
      - 2) Inlet Size: 2 IN.

- 3) Working pressure: 100 PSI.
- 4) Provide with ball-type isolation valve.

## **2.3 METALLIC BALL VALVES 1/4 TO 3 IN DIA**

- A. Comply with MSS SP-110.
- B. Manufacturers:
  1. Apollo.
  2. Jamesbury.
  3. Watts.
  4. Stockham.
  5. Nibco.
- C. Materials (All Stainless Steel):
  1. Body: Three-part stainless steel, ASTM A351 CF8M.
  2. Ball: Stainless steel ASTM A276.
  3. Seats: RPTFE.
- D. Design Requirements:
  1. Rated for 500 psi working pressure.
  2. Two-position lockable handle.
  3. Stem with blowout-proof design.
  4. Balancing stop for all applications.
  5. Bodies with mounting pad for applications requiring actuators.

## **2.4 ACCESSORIES**

- A. Furnish any accessories required to provide a completely operable valve.

## **2.5 FABRICATION**

- A. Completely shop assemble unit including any interconnecting piping, speed control valves, control isolation valves and electrical components.
- B. Provide internal epoxy coating suitable for potable water for all iron body valves in accordance with AWWA C550.

## **2.6 SOURCE QUALITY CONTROL**

- A. Shop hydrostatically test to unit test pressure.

## **2.7 MAINTENANCE MATERIALS**

- A. Provide one set of any special tools or wrenches required for operation or maintenance for each type valve.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. General: See Specification Section 01 61 03 and Specification Section 40 05 51.
- B. Air Release Valves:
  1. Pipe exhaust to a suitable disposal point.
  2. Where exhausted to a trapped floor drain, terminate exhaust line 6 IN minimum above floor.
- C. Float-Operated Valves: Install baffle around float to minimize turbulence adjacent to float.

## **3.2 FIELD QUALITY CONTROL**

- A. Clean, inspect, and operate valve to ensure all parts are operable and valve seats properly.
- B. Check and adjust valves and accessories in accordance with manufacturer's instructions and place into operation.



**END OF SECTION**



## **SECTION 40 05 58**

### **GATES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Slide and shear gates and integral operators.

##### **1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Water Works Association (AWWA):
  - 2. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 3. National Sanitation Foundation International (NSF):
    - a. 61, Drinking Water System Components - Health Effects.
  - 4. Society for Protective Coatings/NACE International (SSPC/NACE):
    - a. SP 10/NACE No. 2, Near-White Blast Cleaning.
- B. The manufacturer shall have 10 years' experience manufacturing shear gates and shall show evidence of satisfactory operation in at least 5 installations. The company shall be ISO 9001 certified.

##### **1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Specification Section 01 61 03.
  - 2. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - 3. Fabrication and/or layout drawings.
  - 4. Certifications.
  - 5. Product technical data including:
    - a. Acknowledgment that products submitted meet the requirements of standards referenced.
    - b. Calculations that demonstrate compliance with the deflection, stress and factor of safety specified.
    - c. Certified drawings and material specifications for ALL components.
    - d. Manufacturer's installation instructions.
    - e. Test records.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Affidavit of Compliance: See AWWA C560.

#### **PART 2 - PRODUCTS**

##### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Slide Gates:
    - a. Waterman USA.

- b. Hydro-Gate.
- c. Fontaine.
- d. Or approved equal.
- 2. Shear Gates:
  - a. Waterman USA.
  - b. Troy Valve.
  - c. Or approved equal.

## **2.2 EQUIPMENT – SLIDE GATES**

- A. Provide heavy duty gates, stems, lifts and other appurtenances of size, type, material and construction shown on the Contract Drawings and as specified herein.
- B. Slide gates shall be of medium duty type.
- C. Comply with requirements of Specification Section 01 61 03.
- D. Gates: Meet all requirements of AWWA C560 as modified per this Specification Section.
- E. Maximum allowable leakage as stated in the AWWA standard.
- F. Materials:
  - 1. Materials subject to dezincification or dealuminization prohibited.
  - 2. Welded stainless steel: Stainless steel, Type 304.
  - 3. Yoke and pedestal: Stainless steel, Type 304.
  - 4. Seat/Seals and Stem Sleeves: Neoprene.
  - 5. Stems: Stainless steel, Type 305.
  - 6. Anchor bolts, lugs, and fasteners: Stainless steel.
  - 7. Flush-bottom retainer bar: Stainless steel, Type 304.

## **2.3 EQUIPMENT – SHEAR GATES**

- A. Shear gates shall be of the heavy-duty design. The body, disc, and removable wedge shall be cast iron
- B. The seat rings, disc ring, hinge bolt, and hinge nut shall be bronze.
- C. The valve shall be single hinged for a tight-closing configuration.
- D. The gate shall be bronze-to-bronze in order to shear off any remaining sludge on the seat.
- E. All iron parts shall be coated per Section 2.6 of this Specification.
- F. Lift rods shall match existing configuration.
- G. The company shall show proof of ISO 9001 certification.

## **2.4 GATE OPERATORS AND LIFTS**

- A. General:
  - 1. Provide lifts in accordance with AWWA C560 or as modified in this Specification Section.
    - a. Match existing installation.
- B. Manual Operators:
  - 1. Equip lift mechanism with a pedestal to match existing installation.
  - 2. Centerline of crank or handwheel: Approximately 36 IN above operating floor, unless otherwise shown.
  - 3. Crank wheel: Removable and fitted with a corrosion resistant rotating handle.

## **2.5 FABRICATION**

- A. Specified in AWWA C560.
- B. Welded Stainless Steel: Passivated after fabrication.

## **2.6 COATINGS**

- A. Surface Preparation:
  - 1. SSPC/NACE SP 10/No. 2.
  - 2. Primed and finish coated with a minimum of two (2) coats of high-solids epoxy as specified in Division 09 Specification Sections.
    - a. NSF 61 certification required for potable water applications.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. For identification and tagging, and for warning or caution signs, comply with Specification Section 10 14 00.
- C. Painting Requirements:
  - 1. Comply with Specification Section 09 96 00.

### **3.2 FIELD QUALITY CONTROL**

- A. Employ and pay for services of equipment manufacturer's field service representative(s) to:
  - 1. Inspect equipment covered by this Specification Section.
  - 2. Supervise adjustments and installation checks.
  - 3. Provide test equipment, tools, and instruments necessary to accomplish equipment testing.
  - 4. Conduct initial start-up of equipment, perform operational checks, and supervise acceptance testing.
  - 5. Provide, through Contractor, a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by Owner's personnel.
  - 6. Instruct Owner's personnel on operation and maintenance of furnished equipment.
- B. Field Leakage Test for Gates: Test gate under design seating head and adjust to satisfy AWWA standards for maximum leakage.

**END OF SECTION**



**SECTION 40 05 61**  
**GATE VALVES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Gate valves.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Section 40 05 51 - Valves - Basic Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. ASTM International (ASTM):
    - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 2. American Water Works Association (AWWA):
    - a. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
    - b. C504, Standard for Rubber-Seated Butterfly Valves.
    - c. C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
  - 3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
    - a. SP-9, Spot Facing for Bronze, Iron and Steel Flanges.
    - b. SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
    - c. SP-80, Bronze Gate, Globe, Angle and Check Valves.
  - 4. National Sanitation Foundation International (NSF):
    - a. 61, Drinking Water System Components - Health Effects.

**1.3 DEFINITIONS**

- A. OS&Y: Outside Screw and Yoke.
- B. NRS: Non-rising Stem.
- C. RS: Rising Stem.

**1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Specification Section 40 05 51.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

**2.2 VALVES: WATER**

- A. Resilient Seated Gate Valves, 2 to 48 IN (Potable Water Application):
  - 1. Comply with AWWA C509.
  - 2. For use in clean water, potable, system which requires NSF-61 certified products.
  - 3. Materials:

- a. Stem and stem nut: Bronze.
  - 1) Wetted bronze parts in low zinc bronze.
- b. Body, gate: Ductile iron.
- c. Resilient wedge: Fully encapsulated rubber wedge.
- 4. Design requirements:
  - a. Minimum 150 PSIG working pressure.
  - b. Exposed: OS&Y, stuffing box stem seal, handwheel.
    - 1) Use NRS for submerged conditions.
  - c. Counterclockwise open rotation.
- 5. Painting:
  - a. The valve interior and exterior, except for disc edge, rubber seat and finished portions shall be evenly coated with an NSF61 approved epoxy coating.
- 6. Manufacturers:
  - a. Clow.
  - b. Mueller.
  - c. American Flow Control.
  - d. M & H.

## **2.3 ACCESSORIES**

- A. Refer to Drawings and valve schedule for type of actuators.
  - 1. Furnish actuator integral with valve.
- B. Refer to Specification Section 40 05 51 for actuator requirements.

## **2.4 FABRICATION**

- A. General:
  - 1. Provide valves with clear waterways the full diameter of the valve.
- B. Spot valves in accordance with MSS SP-9.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. See Specification Section 40 05 51.
- B. Do not install gate valves inverted or with the stems sloped more than 45 DEG from the upright unless the valve was ordered and manufactured specifically for this orientation.

**END OF SECTION**



**SECTION 40 05 64**  
**BUTTERFLY VALVES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Butterfly valves.
- B. Related Sections include but are not necessarily limited to:
  - 1. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.
  - 2. Section 40 05 51 - Valves - Basic Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. B16.5, Pipe Flanges and Flanged Fittings - NPS 1/2 Through NPS 24.
  - 2. ASTM International (ASTM):
    - a. A48, Standard Specification for Gray Iron Castings.
    - b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
    - c. A276, Standard Specification for Stainless Steel Bars and Shapes.
    - d. A395, Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
    - e. A436, Standard Specification for Austenitic Gray Iron Castings.
    - f. A536, Standard Specification for Ductile Iron Castings.
  - 3. American Water Works Association (AWWA):
    - a. C504, Standard for Rubber-Seated Butterfly Valves.
  - 4. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
    - a. SP-67, Butterfly Valves.
  - 5. National Sanitation Foundation International (NSF):
    - a. 61, Drinking Water System Components - Health Effects.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Specification Section 40 05 51.
  - 2. For valves 8 IN and larger, furnish "Affidavit of Compliance" with Owner in accordance with AWWA C504.
- B. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Pratt, a Mueller Water Company.
  - 2. DeZurik.
  - 3. Or Approved Equal.

## **2.2 36 INCH BUTTERFLY VALVES (DIRECT BURIED)**

- A. For use in buried, maybe submerged under groundwater, application. This system is also clean water, potable, system which requires NSF-61 certified products.
- A. Comply only with AWWA C504, as noted in this Specification Section.
- B. Materials:
  - 1. Valve bodies:
    - a. ASTM A536 Grade 65-45-12 ductile iron.
  - 2. Valve shafts:
    - a. One-piece stainless steel, Type 304.
    - b. Pins: 304 stainless steel.
    - c. Bushings/Packing/O-rings: EPDM.
    - d. Bearings: Reinforced TFE or equal.
  - 3. Valve discs:
    - a. 316 Stainless Steel disk.
  - 4. Valve seats:
    - a. Water: EPDM.
  - 5. Painting:
    - a. The valve interior and exterior, except for disc edge, rubber seat and finished portions shall be evenly coated with an NSF61 approved epoxy coating.
- C. Design Requirements:
  - 1. Seat type: Resilient.
  - 2. Body type:
    - a. Flanged
  - 3. Direct buried and submerged valve:
    - a. Design for buried and submerged service
    - b. Secondary packing chamber.
    - c. Gearbox design for buried and submerged conditions.
  - 4. All valves: Working pressure rated for 150 PSI (Class 150B per AWWA C504).
  - 5. Shaft diameter: One-piece constant diameter.

## **2.3 GENERAL USE BUTTERFLY VALVES**

- A. Comply with NSF-61 requirements.
- B. Comply only with AWWA C504, as noted in this Specification Section.
- C. Materials:
  - 1. Valve bodies:
    - a. ASTM A126, Class B or ASTM A536 Grade 65-45-12 ductile iron.
    - b. Wafer valves may be constructed of ASTM A48, Class 40 cast iron.
  - 2. Valve shafts:
    - a. One-piece stainless steel, Type 304.
    - b. Pins: 304 stainless steel.
    - c. Bushings/Packing/O-rings: EPDM, RTFE or TFE.
    - d. Bearings: Reinforced TFE or equal.
  - 3. Valve discs:
    - a. Cast iron with welded nickel edge or 304 Stainless Steel disk.
  - 4. Valve seats:
    - a. Water: EPDM or Hycar.
  - 5. Shaft bearing: Bronze, TFE-coated stainless steel or reinforced TFE.
  - 6. Shaft seal in addition to any sealing provided by seat: Suitable synthetic rubber rings or PTFE V-ring suitable for operating conditions.

- D. Design Requirements:
  - 1. Seat type: Resilient.
  - 2. Shaft diameter: One-piece constant diameter.

## **2.4 ACCESSORIES**

- A. Refer to Drawings and/or valve schedule for type of actuators.
  - 1. Furnish actuator integral with valve.
- B. Refer to Section 40 05 51 for actuator requirements.
- C. Valve Flange Seal Rings:
  - 1. If Steel Slip-on flanges are being used on the process piping, flange seals will be required for proper installation of valves.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. See Section 40 05 51.

**END OF SECTION**



**SECTION 40 05 66**  
**CHECK VALVES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Swing check valves, three-inch to 24-inch diameter.
- B. Related Requirements: Include but are not necessarily limited to:
  - 1. Section 40 05 51 - Valves - Basic Requirements.

**1.2 REFERENCES**

- A. Referenced Standards:
  - 1. American Society of Mechanical Engineers (ASME):
    - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
  - 2. American Water Works Association (AWWA):
    - a. C508, Standard for Swing-Check Valves for Waterworks Service, 2 IN through 24 IN NPS.
  - 3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
    - a. SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
    - b. SP-80, Bronze Gate, Globe, Angle and Check Valves.

**1.3 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Valve Manufacturers:
    - a. Manufacturer shall be a business regularly engaged in manufacturing and furnishing check valves of the type required and similar equipment.
    - b. Manufacturer shall be able to document having furnished not less than 50 check valves, of the type required, of size equal to or larger than those required for the Work, during the past five years.

**1.4 SUBMITTALS**

- A. Action Submittals: Submit the following:
  - 1. In accordance with Section 40 05 51 - Valves Basic Requirements.
- B. Informational Submittals: Submit the following:
  - 1. In accordance with Section 40 05 51 - Valves Basic Requirements.
  - 2. Manufacturer's Instructions:
    - a. Manufacturer's written instructions for delivery, handling, storage, installation, and startup.
- C. Closeout Submittals: Submit the following:
  - 1. Operation and Maintenance Data:
    - a. Submit in accordance with General Provisions Article 5.

**PART 2 - PRODUCTS**

**2.1 SWING CHECK VALVES: 3 IN TO 24 IN**

- A. Rubber Flapper Swing Check Valve:
  - 1. Acceptable Manufacturers:
    - a. APCO Series 100.
    - b. Fivalco equivalent.
    - c. Or equal.

2. Materials:
  - a. Flapper: Buna-N, neoprene, or EPDM with steel or ductile iron reinforcement.
  - b. Body and cover: Ductile iron.
  - c. The valve interior and exterior, except for disc edge, rubber seat and finished portions shall be evenly coated with an NSF61 approved epoxy coating.
3. Design requirements:
  - a. Operating pressure 120 psi working pressure.
  - b. Furnish with oil dashpot type bottom buffer device backflow device.

## **2.2 SOURCE QUALITY CONTROL**

- A. Factory Tests and Inspections:
  1. Perform manufacturer's standard factory tests and inspections on materials and equipment furnished. Correct defects prior to shipment to the Site.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation – General:
  1. Provide check valves at locations shown and indicated in the Contract Documents.
  2. Install in accordance with the Contract Documents and manufacturer's written instructions. In event of conflict between the Contract Documents and manufacturer's written instructions, obtain written interpretation or clarification from Engineer.
  3. Comply with:
    - a. Section 01 61 03 - Equipment - Basic Requirements.
    - b. Section 40 05 51 - Valves - Basic Requirements.
    - c. Section 40 05 00 - Pipe and Pipe Fittings - Basic Requirements.
  4. Before installing, ensure each check valve is clean and free of dirt and debris.

### **3.2 FIELD QUALITY CONTROL**

- A. Field Tests and Inspections:
  1. Promptly after installing, before installing connecting pipe, verify proper and free operation of check valve.
  2. Hydrostatically test check valves together with associated piping.
  3. To extent practical, prior to Substantial Completion, verify proper operation of each installed check valve.

**END OF SECTION**

**SECTION 40 61 13**  
**PROCESS CONTROL SYSTEM GENERAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Basic requirements for complete instrumentation system for process control.
  - 2. Requirement for Contractor to subcontract the Process Control System portion of the Work to a "Systems Integrator".
  - 3. A. Contractor shall secure the services of Tesco Controls to perform the integration work as part of this project.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Section 10 14 00 - Identification Devices.
  - 2. Section 40 67 00 - Control System Equipment Panels and Racks.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. The International Society of Automation (ISA):
    - a. 7.0.01, Quality Standard for Instrument Air.
    - b. S5.1, Instrumentation Symbols and Identification.
    - c. S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems.
    - d. S20, Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
    - e. 62443-3-3 Security for Industrial Automation and Control Systems, Part 3-3: System Security Requirements and Security Levels
  - 2. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 3. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 4. Underwriters Laboratories, Inc. (UL):
    - a. 913, Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.
  - 5. National Institute of Standards and Technology (NIST)
    - a. SP 800-82, Guide to Industrial Control Systems (ICS) Security
- B. Qualifications:
  - 1. Contractor shall secure the services of Tesco Controls to perform the integration work as part of this project.
  - 2. System Integrator:
    - a. Experience:
      - 1) Have satisfactorily provided control system integration for a minimum of five projects of similar magnitude and function.
    - b. Certification:
      - 1) Control Systems Integrators Association (CSIA) Certification
    - c. Qualification:
      - 1) Regularly engaged in the design and the installation of process control and instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry.

- 2) Maintains a permanent, fully staffed and equipped service facility within 100 miles of the project site with full time employees capable of designing, documenting, fabricating, installing, calibrating, programming, configuring, providing training services, and testing the systems specified herein.
  - 3) Capable of responding to on-site problems within 12 hours of notice. Provide an on-site response within 4 hours of notification starting at two months before scheduled startup to two months after startup completion.
- C. Miscellaneous:
1. Comply with electrical classifications and NEMA enclosure types shown on Drawings.

### 1.3 DEFINITIONS

- A. Calibrate: To standardize a device so that it provides a specified response to known inputs.
- B. Hazardous Areas: Class I, II or III areas as defined in NFPA 70.
- C. Highly Corrosive and Corrosive Areas: Rooms or areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.
- D. Intrinsically Safe Circuit: A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under test conditions as prescribed in UL 913.
- E. System Integrator: A Contractor/Subcontractor who combines instrumentation, control devices, hardware, software, and networking products from multiple vendors to provide a fully functioning control system.

### 1.4 SYSTEM DESCRIPTION

- A. Control System Requirements:
1. This Specification Section provides the general requirements for the control system.
  2. The control system consists of all primary elements, transmitters, switches, controllers, computers, communication devices, recorders, indicators, panels, signal converters, signal boosters, amplifiers, special power supplies, special or shielded cable, special grounding or isolation, auxiliaries, software, wiring, and other devices required to provide complete control of the plant as specified in the Contract Documents.
- B. Utilization of System Integrator:
1. Contractor shall secure the services of Tesco Controls to perform the Systems Integration work as part of this project.
  2. Retain a System Integrator subcontractor to provide a fully functioning control system.
    - a. The System Integrator shall be responsible for the provision of an integrated control system fully functioning in accordance with the requirements of the Contract Documents.
  3. Provide all required coordination of instrumentation with other work to ensure that necessary wiring, conduits, contacts, relays, converters, and incidentals are provided in order to transmit, receive, and control necessary signals to other control elements, to control panels, and to receiving stations.

### 1.5 SUBMITTALS

- A. Shop Drawings:
1. Submittals shall be original printed material or clear unblemished photocopies of original printed material.
    - a. Facsimile information is not acceptable.
  2. Limit the scope of each submittal to one Specification Section.
    - a. Each submittal must be submitted under the Specification Section containing requirements of submittal contents.
    - b. Do not provide any submittals for Specification Section 40 61 13.



3. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Equipment catalog cut sheets.
  - c. Instrument data sheets:
    - 1) ISA S20 or approved equal.
    - 2) Separate data sheet for each instrument type.
  - d. Materials of construction.
  - e. Minimum and maximum flow ranges.
  - f. Pressure loss curves.
  - g. Physical limits of components including temperature and pressure limits.
  - h. Size and weight.
  - i. Electrical power requirements and wiring diagrams.
  - j. NEMA rating of housings.
  - k. Submittals shall be marked with arrows to show exact features to be provided.
4. Comprehensive asset inventory of all networked components:
  - a. Provide in Excel spreadsheet format.
  - b. Coordinate with the Owner or Engineer to determine the preferred method of delivery to assure security of information contained in asset inventory.
  - c. Include:
    - 1) Device ID.
    - 2) Manufacturer.
    - 3) Model Number.
    - 4) Serial Number.
    - 5) IP Address.
    - 6) Device Use description.
    - 7) Firmware.
5. Network Diagrams:
  - a. Provide in both AUTO CAD and PDF formats.
  - b. Coordinate with the Owner to determine the preferred method of delivery to assure security of information contained in Network Diagrams.
  - c. Logical Network Diagram(s):
    - 1) Depict information flow through network(s), and include:
      - a) Major network devices, subnets, and VLANs.
      - b) Include all wireless communication devices.
      - c) Include the following information for each networked device:
        - (1) Device ID.
        - (2) Device description.
        - (3) Manufacturer/model number.
        - (4) IP address.
        - (5) Ports and Protocols
  - d. Physical Network Diagram(s):
    - 1) Show all network components, ports, protocols, connections and cables.
      - a) Include all wireless communication devices.
6. Comprehensive set of wiring diagrams as specified in Section 40 67 00.
7. Panel fabrication drawings as specified in Section 40 67 00.
8. PLC equipment drawings.
9. HMI graphics.
10. Nameplate layout drawings.
11. Drawings, systems, and other elements are represented schematically in accordance with ISA S5.1 and ISA S5.3.
  - a. The nomenclature, tag numbers, equipment numbers, panel numbers, and related series identification contained in the Contract Documents shall be employed exclusively throughout submittals.
12. All panel and wiring drawings shall be provided in both hardcopy and softcopy.
  - a. Furnish electronic files on owner's designated electronic media.
  - b. Drawings in AUTO CAD format.

13. Provide a parameter setting summary sheet for each field configurable device.
  14. Certifications:
    - a. Documentation verifying that calibration equipment is certified with NIST traceability.
    - b. Approvals from independent testing laboratories or approval agencies, such as UL, FM or CSA.
      - 1) Certification documentation is required for all equipment for which the specifications require independent agency approval.
  15. Testing reports: Source quality control reports.
- B. Qualifications Submittal:
1. Documentation verifying contractor/subcontractor adherence to specified certifications and qualifications
- C. Contract Closeout Information:
1. Operation and Maintenance Data:
  2. All Shop Drawings shall be modified with as-built information/corrections.
  3. Instrumentation and Control Equipment Operation and Maintenance Manual Content:
    - a. Provide a printed copy of the following sheets following the Equipment Record sheets or ISA Data Sheets.
      - 1) Loop Check-out Sheet.
      - 2) Instrument Certification Sheet.
      - 3) Final Control Element Certification Sheet.
    - b. Provide the following detailed information:
      - 1) Use equipment tag numbers from the Contract Documents to identify equipment and system components.
      - 2) As-constructed fabrication or layout drawings and wiring diagrams.
      - 3) As-constructed network asset inventory, and physical and logical network diagrams.
        - a) Coordinate with the Owner to determine the preferred method of delivery to assure security of this information.
    - c. Additional information as required in the associated equipment or system Specification Section.
  4. Warranties: Provide copies of warranties and list of factory authorized service agents.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Do not remove shipping blocks, plugs, caps, and desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent connections are made.

## **PART 2 - PRODUCTS**

### **2.1 NEMA TYPE REQUIREMENTS**

- A. Provide enclosures/housing for control system components in accordance with the area designations provided on the Drawings.
  1. Areas designated as wet and/or corrosive: NEMA Type 4X.
  2. Either architecturally or non-architecturally finished areas designated as dry, noncorrosive, and nonhazardous: NEMA Type 12.

### **2.2 PERFORMANCE AND DESIGN REQUIREMENTS**

- A. Contractor shall secure the services of Tesco Controls to perform the integration work as part of this project.
- B. Unless stated otherwise, system operating criteria are as follows:
  1. Stability: After controls have taken corrective action, as result of a change in the controlled variable or a change in setpoint, oscillation of final control element shall not exceed two cycles per minute or a magnitude of movement of 0.5% full travel.

2. Response: Any change in setpoint or change in controlled variable shall produce a corresponding corrective change in position of final control element and become stabilized within 30 seconds.
3. Agreement: Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 3% of full scale over a 6:1 operating range.
4. Repeatability: For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5% of full travel regardless of force required to position final element.
5. Sensitivity: Controls shall respond to setpoint deviations and measured variable deviations within 1.0% of full scale.
6. Performance: All instruments and control devices shall perform in accordance with manufacturer's specifications.

### **2.3 ACCESSORIES**

- A. Provide identification devices for instrumentation system components in accordance with Specification Section 10 14 00.
- B. Provide corrosion resistant spacers to maintain 1/4 IN separation between equipment and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Clarifiers, Digesters, Reservoirs, etc.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Contractor shall secure the services of Tesco Controls to perform the integration work as part of this project.
- B. Wherever feasible, use bottom entry for all conduit entry to instruments and junction boxes.
- C. Install electrical components per the requirements of the Electrical design.

### **3.2 FIELD QUALITY CONTROL**

- A. See Section 40 61 21.

**END OF SECTION**



# Loop Check-out Sheet

Project Name:	Owner's Project No. (if applicable):	Page of
Project Owner:	Regulatory Agency Project No. (if applicable):	
HDR Project No.:	Date:	

## LEAK AND TERMINATION/CONTINUITY CHECKS

DESCRIPTION	FIELD					CONTROL CAB	
	LEAK CHECK <sub>(1)</sub>			TERM/CONT CHECK <sub>(2)</sub>		TERM/CONT CHECK <sub>(2)</sub>	
	Device Tag No.	Process Conn.	Signal Tube	Device Tag No.	Termination Ident.	Device Tag No.	Termination Ident.

1. Leak check for pneumatic signal tubing to be per ISA-PR7.1.
2. Termination/continuity check includes check at terminated equipment for: (a) correct polarity, (b) appropriate signal generation, transmission and reception, and (c) correct shield & ground terminations.

## OPERATOR INTERFACE CHECK-OUT

### MONITORING POINTS OBSERVED

PARAMETER TYPE	TAG NO.	TAG NO.	TAG NO.	TAG NO.	TAG NO.	TAG NO.
PROCESS VAR						
EQUIP STATUS						
ALARM POINT						

### OPERATOR CONTROL FUNCTIONS CHECKED

FUNCTION TYPE	TAG NO.	LOCATION	TAG NO.	LOCATION	TAG NO.	LOCATION

### FINAL CONFIGURED SETTINGS

TAG NO.	SWITCH & ALARM SP	CONTROLLERS			
		Gain	Reset, rpm	Deriv. (rate), min	PV Set Point

Describe all interlocks checked, equipment started/stopped, valves/operators stroked. Describe modes of operation checked, and location of operator interface (local/remote).

I certify that the control loop referenced on this page has been completely checked and functions in accordance with applicable drawings and specifications.

Certified by: \_\_\_\_\_  
(Work Performed By)

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



## Instrument Certification Sheet

Project Name:	Owner's Project No. (if applicable):
Project Owner:	Regulatory Agency Project No. (if applicable):
HDR Project No.	Date:
Control Loop No.:	
Instrument Tag No.	Transmitter/gauge span:
Manufacturer:	Switch set-point:
Model No.	Switch dead band:
Serial No.	Switch range:

### TRANSMITTERS AND INDICATORS

% OF SPAN	INCREASING INPUT			DECREASING INPUT		
	INPUT	OUTPUT	ERROR (% of span)	INPUT	OUTPUT	ERROR (% of span)
0%						
25%						
50%						
75%						
100%						
Other (if applicable)						
Other (if applicable)						

### SWITCHES

ACTUATION POINT	INCREASING INPUT			DECREASING INPUT		
	INPUT	OUTPUT	ERROR (% of range)	INPUT	OUTPUT	ERROR (% of range)
High (Increasing input)						
Low (Decreasing input)						

Maximum allowable error (per Contract Documents): \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

### CALIBRATION EQUIPMENT UTILIZED

DEVICE TYPE	MFR/MODEL NO.	ACCURACY	NIST TRACEABILITY?

Certified by: \_\_\_\_\_

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



## Final Control Element Certification Sheet

Project Name:	Owner's Project No. (if applicable):
Project Owner:	Regulatory Agency Project No. (if applicable):
HDR Project No.	Date:
Control Loop No.:	

Tag No.	Actuator: Pneumatic: _____ Electric: _____
Description:	Positioner: Direct: _____ Reverse: _____
Manufacturer:	Positioner: Input: _____ Output: _____
Model No.	I/P Converter: Input: _____ Output: _____
Serial No.	Valve to _____ on air failure
	Valve to _____ on power failure

### I/P CONVERTER

	INCREASING INPUT			DECREASING INPUT		
% OF SPAN	INPUT	OUTPUT	ERROR (% of span)	INPUT	OUTPUT	ERROR (% of span)
0%						
25%						
50%						
75%						
100%						

Specified I/P converter accuracy: \_\_\_\_\_ % of span.

### FINAL CONTROL ELEMENT

	INCREASING INPUT			DECREASING INPUT		
% OF SPAN	INPUT	TRAVEL	ERROR (% of full travel)	INPUT	TRAVEL	ERROR (% of full travel)
0%						
25%						
50%						
75%						
100%						

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

### CALIBRATION EQUIPMENT UTILIZED

DEVICE TYPE	MFR/MODEL NO.	ACCURACY	NIST TRACEABILITY?

Certified by: \_\_\_\_\_

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

**SECTION 40 61 21**  
**PROCESS CONTROL SYSTEM TESTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for testing of the Process Control System (PCS) hardware and software prior to shipment to the site for installation.
    - a. Inspection.
      - 1) System hardware operational testing.
      - 2) System software demonstration.
    - b. Test records.
  - 2. Requirements for field testing of the PCS hardware and software.
    - a. Process Control System checkout.
    - b. Instrument calibration.
    - c. Loop testing/checkout.
    - d. Integrated Site Acceptance Test (SAT).
    - e. Operational Readiness Demonstration (ORD).
- B. Related Sections include but are not necessarily limited to:
  - 1. Section 40 61 13 - Process Control System General Requirements.
  - 2. Section 40 61 96 - Process Control Descriptions.
  - 3. Section 40 67 00 - Control System Equipment Panels and Racks.

**1.2 SUBMITTALS**

- A. See Specification Section 40 61 13 - Process Control System General Requirements.
- B. Field Testing Shop Drawings:
  - 1. Site Acceptance Test (SAT) Plan.
    - a. Divide into separate sections based on process systems.
    - b. Each section shall include a sequential step-by-step checkout plan.
  - 2. Typical Loop Checkout Sheets, if other than the form included within contract documents.
  - 3. Typical Instrument Certification Sheets, if other than the form included within contract documents.
  - 4. Typical Final Control Element Certification Sheets, if other than the form included within contract documents.
- C. Contract Closeout Information:
  - 1. Site Acceptance Test (SAT) Report.
  - 2. Completed Loop Checkout Sheets.
  - 3. Completed Instrument Certification Sheets.
  - 4. Completed Final Control Element Certification Sheets.
  - 5. All system startup and checkout records, test records, recommendations and information furnished by Manufacturer's representatives during testing and startup, and amended documentation specified herein.

**PART 2 - PRODUCTS – NOT USED**

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Maintain accurate daily log of all testing activities, calibration functions, and final set point adjustments.

- B. All testing may be witnessed by the Owner or Engineer.

### **3.2 INSTALLATION AND CHECKOUT**

- A. Provide the following (after successful completion of the Factory Acceptance Test):
1. Check and approve the installation of all Process Control System (PCS) components (including but not limited to control panels, field instruments, networking equipment and racks, patch panels and all cable and wiring interconnects between various equipment, panels and devices) prior to placing the various processes and equipment into operation. As a minimum, include:
    - a. Verification and documentation that all field instruments and pneumatic signals function properly and are properly calibrated.
    - b. Testing of all final control actions.
- B. Provide services of authorized manufacturer's representatives to check and verify the correctness of the installation and operation of equipment.

### **3.3 PRE-DEMONSTRATION PERIOD TESTING**

- A. Instrumentation Calibration:
1. Verify and document that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.
  2. Factory furnished calibration certifications are acceptable for the following:
    - a. Flow meters.
    - b. Pressure sensors utilized with annular sleeve.
    - c. Temperature sensors.
  3. On-site calibration verification is required for all other instruments, including "smart" transmitters that have been factory calibrated.
    - a. Provide calibration checks at 0 %, 25 %, 50 %, 75 % and 100 % of span for pressure transmitters and gages.
      - 1) Check for both increasing and decreasing input signals to detect hysteresis.
    - b. In addition to factory calibration certification, temperature sensors and gages shall be checked at a single point for conformance to required accuracy.
    - c. Level transducers/transmitters shall be checked at two points in addition to zero.
    - d. Analytical sensors shall be calibrated in accordance with manufacturer's recommendations.
    - e. Check operation of all switches to verify actuation occurs in accordance with manufacturer's specified accuracy.
    - f. Replace any instrument which cannot be properly adjusted.
    - g. Stroke pneumatic control valves with clean dry air to verify control action, positioner settings, and solenoid functions.
  4. Mark range, date, set point and calibrator's initials on each instrument by means of blue or black ink on a waterproof tag affixed to the instrument.
  5. Calibration equipment shall be certified by an independent agency with traceability to NIST.
    - a. Certification shall be up-to-date.
    - b. Use of equipment with expired certifications shall not be permitted.
  6. Calibration equipment shall be at least three times more accurate as the device being calibrated.
- B. Loop Testing:
1. Utilize the Loop Check-Out Sheet located at the end of Section 40 61 13 (or Engineer approved equivalent) to document on-site calibration checks.
    - a. Utilize separate loop checkout form for each loop.
  2. Minimum loop checkout requirements:
    - a. Use actual signals where available.
    - b. Check control signal generation, transmission, reception and response for all inputs and outputs for all control loops under simulated operating conditions by imposing a signal on the loop at the instrument connections.



- c. Closely observe controllers, indicators, transmitters, HMI displays, OIT displays, recorders, alarm and trip units, remote set points, ratio systems, and other components.
    - 1) Verify that readings at all loop components are in agreement.
    - 2) Make corrections as required.
    - 3) Following any corrections, retest the loop.
  - d. Stroke all control valves, cylinders, drives and connecting linkages from the local control station and from the control room operator interface.
  - e. Check all interlocks for proper functionality.
  - f. Record all set point and calibration changes on all affected Contract Documents and turn over to Owner.
- C. Integrated Site Acceptance Test (SAT):
- 1. Following the testing of each individual loop, perform an integrated Site Acceptance Test (SAT) to verify that all equipment and programmed software are operating as described in the Contract Documents and equipment manufacturers recommendations. Checks to include:
    - a. The intended monitoring and control functions of the PCS including all vendor-furnished equipment packaged systems, communications, operator interfaces, statuses, alarms, trends and recording of historical tags.
    - b. Integrated testing on a system by system basis as described in the submitted Site Acceptance Test (SAT) plan sequential step-by-step checkout plan.
      - 1) Documentation with initials of the individuals who perform each test.
  - 2. Provide minimum fifteen (15) day notice to the Owner prior to commencing the SAT.
  - 3. Promptly address and re-test any malfunctions, issues and incompletions arising during the SAT.

## **END OF SECTION**



**SECTION 40 61 93**  
**PROCESS CONTROL SYSTEM INPUT-OUTPUT LIST**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Process Control System (PCS) PLC Input/Output (I/O) List description.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Section 40 61 13 - Process Control System General Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. The International Society of Automation (ISA):
    - a. 5.1, Instrumentation Symbols and Identification.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. Any proposed deviations from the I/O List format, content and attributes stipulated in this Section shall be submitted for approval. I/O List development shall not proceed until the deviation has been approved.
  - 2. Pre-fabrication I/O Lists for approval.
- B. Informational Submittals:
  - 1. I/O Lists:
    - a. Post-Commissioning Final I/O Lists.
    - b. Submit I/O Lists in PDF and native format Microsoft Excel indexed by Area, Panel, and Point Description.

**PART 2 - PRODUCTS**

**2.1 I/O LIST**

- A. The I/O List in the Appendix 40 61 93A to this Section herein contains I/O point information derived from the Contract drawings and specifications.
- B. The I/O List shall be used as the starting point in the development of the final PLC I/O database.
  - 1. The I/O list does not include internal software points generated by the control system and is used solely within the control system.
- C. The I/O List is organized in columns as follows:
  - 1. I/O TAG describes the point name that will be used throughout the control system to identify the point.
  - 2. P&ID references the Process and Instrumentation Diagram on which the point is depicted in relation to the process and equipment.
  - 3. I/O TYPE denotes the signal type such as analog input or output, discrete input or output, pulse, etc.
  - 4. INTERFACE denoted the method of communication (hardwired, via data-link, etc.).
  - 5. POINT DESCRIPTION is a concise English language description of the point's function in relation to the process in terms that a user can easily understand.
  - 6. PANEL indicates the control panel in which the I/O module is located.
  - 7. FIELD DEVICE TAG is the tag assigned to the associated field instrument (if applicable).
  - 8. SIGNAL TYPE is the type of electrical signaling used.
  - 9. CALIBRATED RANGE is the minimum and maximum (range) limit in engineering units of an analog input or output signal.

10. ENGINEERING UNITS lists the units associated with the point value.
  11. DIGITAL ZERO STATE is the state descriptor associated with the open or zero (0) state of a discrete signal. Ex. ALARM, OFF, HIGH, FAILED.
  12. DIGITAL ONE STATE is the state descriptor associated with the closed or one (1) state of a discrete signal. Ex. NORMAL, ENERGIZED, FLOW.
  13. INTERPOSING RELAY indicates if a relay needs to be interposed between the control system and the field signal.
  14. NOTES is for any pertinent notations that help in identification or understanding of the signal source, features or new/existing status.
  15. REV indicates the number of revisions of that I/O point since the bid.
- D. I/O List:
1. Refer to Appendix 40 61 93A.

### **PART 3 - EXECUTION**

#### **3.1 I/O DATABASE DEVELOPMENT**

- A. The Systems Integrator shall develop the complete I/O List containing all information needed to facilitate panel building, testing and programming, and the fully document the I/O layout and interconnections.
- B. The Systems Integrator shall obtain the Owner's existing tag naming conventions, abbreviations, facility codes, standard state descriptors, and other relevant information prior to creating the I/O List.
- C. Prior to the start of PLC panel fabrication, the Systems Integrator shall submit an I/O List for review and approval
- D. The I/O List shall include for each I/O point, at minimum, all information as listed in Section 2.1.C.
- E. Maintain a copy of the complete I/O List with modifications during construction in native file format. I/O List shall be accessible to Owner and Engineer upon request.
- F. Following successful project Commissioning, submit an "As Installed" final I/O List, with all fields representing the updated information, including all field updated information.

#### **3.2 I/O POINT DATA FIELDS**

- A. Information in the I/O List data fields may be subject to review and modification by the Owner or Engineer during the Submittal review phase.
  1. Incorporate changes as directed by the reviewer through the system and associated documentation, at no additional cost to the Owner, subject to the following limitations:
    - a. Requested modifications shall be limited to 20% of the total number of I/O points.
      - 1) This 20% shall not include changes to the I/O List prior to the Submittal review.
      - 2) Corrections for errors by the Systems Integrator shall not count toward the 20% modification limit.
    - b. Each unique change shall count as one modification.
      - 1) For example, modifying the description, range, and engineering unit for one analog input counts as three separate modifications.
    - c. Analog input alarm limit adjustments shall not count as modifications.

### **END OF SECTION**

PLC Input/Output (I/O) List

Plant / Process Area	Process/ Equipment	Equipment #	Modifier	SignalType	I/O Tag	P&ID	I/O Type	Interface	Point Description	Panel	Field Device Tag	Signal Type	Calibrated Range	Engineering Units	Digital Zero State	Digital One State
6	PMP	308		SC	6_PMP_308_SC	I02	AO	Hardwired	Backwash and Recycled Pump 308 - Speed Control	PBCP	6-P-308	4-20mA	0-100	%		
6	PMP	308		SI	6_PMP_308_SI	I02	AI	Hardwired	Backwash and Recycled Pump 308 - Speed Indicator	PBCP	6-P-308	4-20mA	0-100	%		
6	PMP	308		YI	6_PMP_308_YI	I02	DI	Hardwired	Backwash and Recycled Pump 308 - Running	PBCP	6-P-308	-	-	-	Stopped	Running
6	PMP	308	A	HS	6_PMP_308A_HS	I02	DI	Hardwired	Backwash and Recycled Pump 308 - In Auto	PBCP	6-P-308	-	-	-	In Auto	Not in Auto
6	PMP	308		TSH	6_PMP_308_TSH	I02	DI	Hardwired	Backwash and Recycled Pump 308 - High Temperature	PBCP	6-P-308	-	-	-	High Temperature	Normal
6	PMP	308		YA	6_PMP_308_YA	I02	DI	Hardwired	Backwash and Recycled Pump 308 - Fault	PBCP	6-P-308	-	-	-	Faulted	Normal
6	PMP	308		HC	6_PMP_308_HC	I02	DO	Hardwired	Backwash and Recycled Pump 308 - Run Command	PBCP	6-P-308	-	-	-	Stop	Run
6	PMP	308		MSH	6_PMP_308_MSH	I02	DI	Hardwired	Backwash and Recycled Pump 308 - High Moisture	PBCP	6-P-308	-	-	-	High Moisture	Normal
6	PMP	309		SC	6_PMP_309_SC	I02	AO	Hardwired	Backwash and Recycled Pump 309 - Speed Control	PBCP	6-P-309	4-20mA	0-100	%		
6	PMP	309		SI	6_PMP_309_SI	I02	AI	Hardwired	Backwash and Recycled Pump 309 - Speed Indicator	PBCP	6-P-309	4-20mA	0-100	%		
6	PMP	309		YI	6_PMP_309_YI	I02	DI	Hardwired	Backwash and Recycled Pump 309 - Running	PBCP	6-P-309	-	-	-	Stopped	Running
6	PMP	309	A	HS	6_PMP_309A_HS	I02	DI	Hardwired	Backwash and Recycled Pump 309 - In Auto	PBCP	6-P-309	-	-	-	In Auto	Not in Auto
6	PMP	309		TSH	6_PMP_309_TSH	I02	DI	Hardwired	Backwash and Recycled Pump 309 - High Temperature	PBCP	6-P-309	-	-	-	High Temperature	Normal
6	PMP	309		YA	6_PMP_309_YA	I02	DI	Hardwired	Backwash and Recycled Pump 309 - Fail	PBCP	6-P-309	-	-	-	Faulted	Normal
6	PMP	309		HC	6_PMP_309_HC	I02	DO	Hardwired	Backwash and Recycled Pump 309 - Run Command	PBCP	6-P-309	-	-	-	Stop	Run
6	PMP	309		MSH	6_PMP_309_MSH	I02	DI	Hardwired	Backwash and Recycled Pump 309 - High Moisture	PBCP	6-P-309	-	-	-	High Moisture	Normal
6	PMP	310		SC	6_PMP_310_SC	I02	AO	Hardwired	Backwash and Recycled Pump 310 - Speed Control	PBCP	6-P-310	4-20mA	0-100	%		
6	PMP	310		SI	6_PMP_310_SI	I02	AI	Hardwired	Backwash and Recycled Pump 310 - Speed Indicator	PBCP	6-P-310	4-20mA	0-100	%		
6	PMP	310		YI	6_PMP_310_YI	I02	DI	Hardwired	Backwash and Recycled Pump 310 - Running	PBCP	6-P-310	-	-	-	Stopped	Running
6	PMP	310	A	HS	6_PMP_310A_HS	I02	DI	Hardwired	Backwash and Recycled Pump 310 - In Auto	PBCP	6-P-310	-	-	-	In Auto	Not in Auto
6	PMP	310		TSH	6_PMP_310_TSH	I02	DI	Hardwired	Backwash and Recycled Pump 310 - High Temperature	PBCP	6-P-310	-	-	-	High Temperature	Normal
6	PMP	310		YA	6_PMP_310_YA	I02	DI	Hardwired	Backwash and Recycled Pump 310 - Fail	PBCP	6-P-310	-	-	-	Faulted	Normal
6	PMP	310		HC	6_PMP_310_HC	I02	DO	Hardwired	Backwash and Recycled Pump 310 - Run Command	PBCP	6-P-310	-	-	-	Stop	Run
6	PMP	310		MSH	6_PMP_310_MSH	I02	DI	Hardwired	Backwash and Recycled Pump 310 - High Moisture	PBCP	6-P-310	-	-	-	High Moisture	Normal



**SECTION 40 61 96**  
**PROCESS CONTROL DESCRIPTIONS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section is intended to describe the functional and operational requirements of the process being monitored and controlled by the process control system, and to define the Contractor's responsibilities related to the work described herein.
- B. Section Includes:
  - 1. Document Maintenance and Content Requirements.
  - 2. Process Control Description content and structure.
- C. Related Sections include but are not necessarily limited to:
  - 1. Section 40 61 13 – Process Control Systems General Requirements.
- D. General Requirements:
  - 1. The Process Control Descriptions describe the operational interface and functional requirements of the Process Control System (PCS) and of the control loops and other PCS functions represented in the Contract Documents.
  - 2. The Process Control Descriptions do not necessarily address every PCS point or alarm point associated with the process or equipment. Provide and incorporate all hard-wired, networked and internal equipment alarms as shown on the P&IDs, the I/O Lists, the Instrument Lists, or elsewhere within the Contract Documents, as well as other points required to meet the intent of the system control.
  - 3. The process control descriptions are not intended to be an inclusive listing of all elements and appurtenances required to execute loop functions, but are rather intended to supplement and complement the Drawings and other Specification Sections.
  - 4. The Process Control Descriptions shall not be considered equal to a bill of materials.
  - 5. Provide instrumentation hardware and software as necessary to perform control functions specified herein and shown on Drawings.
  - 6. Unless otherwise specified, the following general requirements apply to all process control descriptions.
    - a. Analog control loops shall operate based on a standard PID controller, with the controller faceplate incorporated on the PCS HMI graphic display. The PID controller faceplate includes (but is not limited to) the following functions:
      - 1) Bar graphs for setpoint, process variable and percent output, poke point buttons for Auto/Manual Mode selection, and a numeric entry field with popup keypad for Operator entered values.
        - a) Auto/Manual Mode selection: In Auto Mode, the output of the controller is based on the PID controller calculation. In Manual Mode, the output of the controller is operator adjustable. Switching between the PID controller's operational modes shall be configured with setpoint tracking and bump-less transfer.
        - b) Compound Mode, where applicable: In the Compound Mode, the setpoint is trimmed by a remote setpoint input. This mode is used in applications requiring a cascade control loop such as level/flow.
      - 2) When in the Automatic Mode, PID algorithms shall monitor the margin of error between the setpoint value and the actual process variable. A deviation of +/- 10% between setpoint and process variable generates a Deviation Alarm notifying the operator of the condition. The % of deviation is an adjustable value.

- b. All motors (constant and variable speed) must be monitored for the associated Run, Stop, and Fail status. When the PCS initiates a run command output, the PCS logic monitors the running status feedback from the motor (starter or variable speed drive) and produces a "Fail to Run" or "Fail to Stop" alarm (as applicable) if the motor feedback does not correspond with the status of the PCS initiated command output. A PCS internal delay timer with typical preset of 15 SEC (individually adjustable) shall be configured for each logic statement to allow the motor control adequate time to comply with the output command.
  - 1) The PCS output command is de-energized subsequent to the expiration of the alarm delay time period, i.e. a timed-out command.
- c. Analog inputs shall have a signal Out Of Range Alarm generated via a PCS internal timer when the PCS input is < 3.8 mADC or > 20.5 mADC. The alarm delay timer preset is initially set at 20 SEC. The delay preset value is operator adjustable.
- d. All flow inputs shall be totalized (integrated) and logged on the PCS historian. All totalized values are displayed on the PCS HMI graphic display in the appropriate engineering units as required. Provide daily flow totals for all measured flows.
- e. All equipment run times shall be totalized, displayed and logged on the PCS historian. Run times shall have a resolution of one minute and be displayed in hours and tenths of hours on the appropriate PCS HMI graphic display.
- f. For each piece of process equipment controllable by the PCS, an equipment "ready" or control mode permissive signal is needed to indicate to the PCS control logic PCS control is allowed. The PCS shall monitor the Local Control Panel mounted L/R mode selector switch and control the equipment that is in the Remote mode.
- g. I/O points shown on the P&IDs, I/O List or elsewhere within the Contract Documents shall be incorporated into the PCS HMI and OIT graphic displays as indicated by their function.
- h. Operator entry of setpoints shall be limited to values within upper and lower operating limits corresponding to the valid operating range of the equipment. An operator-entered setpoint outside the valid range must be rejected by the PCS and the original setpoint shall be maintained until a valid value is entered. When an invalid setpoint is entered into the system, an Invalid Value message shall appear in the setpoint entry faceplate, alerting the operator to the condition. The upper and lower range limits are adjustable.
- i. In addition to the requirements specifically stated within each Process Control Description, all control software and hardware shall be provided as required to ensure the safe and reliable operation of all controlled equipment.
- j. All "soft" alarms on analog signal shall reside in the PLC logic with de-bounce timers. Provide the capability to modify the soft setpoints through the HMI system with appropriate security.
- k. All alarm and trip time delays shall be adjustable from the HMI system by an operator with appropriate security.
- l. All process values, ranges, and setpoints described herein shall be considered "Initial values" and may be changed during installation and start-up.
- m. All measured analog values shall be logged and available for trending via Operator selection at the HMI.

## 1.2 DEFINITIONS/ABBREVIATIONS

A. Abbreviations are defined as listed below:

A/M	Auto/Manual
ATS	Automatic Transfer Switch
DCS	Distributed Control System
DPU	Distributed Processing Unit



H/O/A	Hand-Off-Auto
H/O/R	Hand-Off-Remote
HMI	Human-Machine Interface
L/O/R	Local-Off-Remote
L/R/O	Local/Remote/Off
L/R	Local/Remote
LCP	Local Control Panel
LCS	Local Control Station
MCC	Motor Control Center
O/C	Open/Close
OI	Operator Interface (valve actuator, VFD)
OIT	Operator Interface Terminal
P&ID	Process and Instrumentation Diagram
PCS	Process Control System
PID	Proportional-Integral-Derivative
PFD	Process Flow Diagram
PLC	Programmable Logic Controller
RIO	Remote DCS or PLC Input/Output Equipment
RTU	Remote Terminal Unit
RVSS	Reduced Voltage Solid-state Starter
S/S	Start/Stop
UPS	Uninterruptible Power Supply
VFD	Variable Frequency Drive

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### A. Control Strategy for Record Documents:

1. Obtain this Specification Section in electronic format (Microsoft Word) from Engineer at beginning of Project. Provide updated Process Control Descriptions as follows:
  - a. As needed or requested following any PCS workshops, working sessions, and/or related submittal reviews.
  - b. As needed or requested during the course of programming, start-up and testing to reflect all refinements and changes that occur due to specific operational needs and the characteristics of specific equipment and systems supplied under this Contract.
  - c. Show all revisions in 'track change' mode.
  - d. Change Specification Section Title to read "Process Control Descriptions - Contractor Record Document."
  - e. Reference all changes by Request for Information (RFI) number or Change Proposal Request (CPR) number.
2. Submit the revised and updated file as a final Process Control description Record Document in the Operation and Maintenance Manual.

- a. Provide both paper copy and as Electronic Documents (in portable document format, PDF files) by Electronic Means of the Record Document process control descriptions in the Operation and Maintenance Manual.
- B. Coordination with vendor-furnished control packages
  1. Provide all programming as required to integrate Vendor-furnished controls into the PCS as described in the Contract Documents.

## **PART 2 - PRODUCTS - (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 PROCESS CONTROL DESCRIPTIONS**

- A. General:
  1. All analog values to have a minimum of 3 configurable alarm or control points adjustable over full range of analog point.
  2. All analog outputs shall be capable of being forced from SCADA screen using screen slider.
  3. All digital outputs shall be capable of being forced from SCADA screen.
  4. Provide alarm SCADA screen showing all active alarms. Show 3 most current alarms on all SCADA screens.
  5. Provide SCADA screen showing run time for each drive and number of starts during past 24 hour period.
  6. Provide SCADA communication screen showing communication data for each PLC and current status of each PLC.
  7. Loss of power will cause all drives to shut down. Upon restoration of power drives in Auto shall start in sequence to state prior to power failure and then return to normal control.
  8. If a drive is called to start or valve to open and fails to start or open with in a preset time an alarm shall be generated and the next drive in sequence shall be started where applicable.
  9. If a drive is running in Auto and stops while still called, the next drive in sequence shall be started and an alarm generated.
  10. If a drive is called to stop or valve to close and fails to stop or close with in a preset time an alarm shall be generated.
- B. Reclaimed Backwash Water Pumping System:
  1. There is a total of three reclaimed backwash water (RBW), VFD driven, submersible pumps located inside a wet well of the Decant Pump Station. The operator may manually select the LEAD, LAG, and STANDBY pumps. However, the pumps shall normally be operated in AUTOMATIC control mode which shall implement a “auto-rotation” feature to balance the run times on all three pumps.
    - a. Coordinate with the Owner for the desired run times prior to automatic rotation.
  2. When operating in an AUTOMATIC control mode, pump speed can be automatically paced (also known as “flow paced”) to total raw water influent flow. AUTOMATIC operation is as follows:
    - a. In AUTOMATIC control mode no more than 2 pumps can be called to run at a time.
    - b. Due to regulatory constraints, in AUTOMATIC control mode, the pump speeds shall be paced proportional to 0 – 10 percent of total raw water influent flow (also referred to as flow pace requirement). However, the operator shall have the option to manually flow pace to 0 – 100 percent of total raw water influent flow.
    - c. Pump speed shall gradually increase speed up to 100% in accordance with the flow pace requirement. If the LEAD pump fails to operate (after a time delay, initially set at 10 SEC), then the LAG pump will be commanded to operate as the LEAD pump.

- d. If the LEAD pump has been running at maximum speed for a set period of time and it is not able to supply the flow pace requirement, the LAG pump will be commanded to operate. The LEAD pump will slow down to minimum speed while the LAG pump starts. Once the LAG pump reaches minimum speed, both pumps will operate together at the same speed. Both pumps gradually increase speed up to 100% in accordance with the flow pacing requirement. If either one of the two operating pumps fails to operate (after a time delay, initially set at 10 SEC), then the STANDBY pump will be commanded to operate as the LAG pump.
  - e. PLC logic utilizes a 1-minute time delay (adjustable) prior to commanding an additional pump to start following the start of the previous pump.
  - f. If the flow pace requirement decreases with the LEAD and LAG pumps running at a minimum set speed for a set period of time (initially set at 15 SEC), the PLC commands the LAG pump to stop.
  - g. If the flow pace requirement decreases with only the LEAD pump operating at a minimum speed for a set period of time (initially set at 15 SEC), the PLC commands the LEAD pump to stop.
- 3. There are two existing level instruments. Provide high and low wet well alarms.
    - a. Coordinate with the Owner for corresponding elevations.
    - b. Low wet well alarm shall be set at an Owner-selected value higher than the pump manufacturer's stated "minimum submergence" requirement.
    - c. High wet well alarm shall be set at an Owner-selected value lower than the invert elevation of the RBW overflow piping.
  - 4. Pumping system is to restart in sequence after a power failure.
  - 5. Provide adjustable ramp time of 30 seconds to 60 seconds from zero to full speed and adjustable time of 30 to 60 seconds for time between pump starts and stops.

## **END OF SECTION**



**SECTION 40 67 00**  
**CONTROL SYSTEM EQUIPMENT PANELS AND RACKS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for control panels and enclosures utilized as follows:
    - a. Unless noted otherwise, all control panels and enclosures housing control components that are specified in Section 40 78 00.
    - b. This Section is only applicable to panels furnished with equipment specified in other specification divisions when so stated in the applicable equipment specification section.
- B. Related Sections include but are not necessarily limited to:
  - 1. Section 10 14 00 - Identification Devices.
  - 2. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
  - 3. Section 40 61 13 - Process Controls Systems General Requirements.
  - 4. Section 40 61 21 - Process Control System Testing.
  - 5. Section 40 78 00 - Panel Mounted Instruments.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. ASTM International (ASTM):
    - a. B75, Standard Specification for Seamless Copper Tube.
  - 3. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. ICS 4, Industrial Control and Systems: Terminal Blocks.
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC):
      - 1) Article 409, Industrial Control Panels.
  - 5. Underwriters Laboratories, Inc. (UL):
    - a. 508A, Standard for Safety Industrial Control Panels.
    - b. 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
- B. Qualifications:
  - 1. See Section 40 61 13 - Process Control Systems General Requirements.
- C. Miscellaneous:
  - 1. Approved supplier of Industrial Control Panels under provisions of UL 508A or UL 698A.
    - a. Entire assembly shall be affixed with a UL 508A or UL 698A label "Listed Enclosed Industrial Control Panel" prior to shipment to the jobsite.
    - b. Control panel(s) without an affixed UL 508A or UL 698A label shall be rejected and sent back to the Contractor's factory.

**1.3 DEFINITIONS**

- A. Panel: Control panels or enclosures listed in the schedule included in this Specification Section.
- B. Foreign Voltages: Voltages that may be present in circuits when the panel main power is disconnected.
- C. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.

- D. Instrumentation Cable:
  - 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
  - 2. Instrumentation cable is typically either TSP (twisted-shielded pair) or TST (twisted-shielded triad), and is used for the transmission of low current or low voltage signals.
- E. Ground Fault Circuit Interrupter (GFCI): A type of device (e.g., circuit breaker or receptacle) which detects an abnormal current flow to ground and opens the circuit preventing a hazardous situation.
- F. Programmable Logic Controller (PLC): A specialized industrial computer using programmed, custom instructions to provide automated monitoring and control functions by interfacing software control strategies to input/output devices.
- G. Remote Terminal Unit (RTU): An industrial data collection device designed for location at a remote site, that communicates data to a host system by using telemetry such as radio, dial-up telephone, or leased lines.
- H. Input/Output (I/O): Hardware for the moving of control signals into and/or out of a PLC or RTU.
- I. Supervisory Control and Data Acquisition (SCADA): Used in process control applications, where programmable logic controllers (PLCs) perform control functions but are monitored and supervised by computer workstations.
- J. Highway Addressable Remote Transducer (HART): a bi-directional communication protocol that provides data access between intelligent field instruments and host systems.
- K. Digital Signal Cable: Used for the transmission of digital communication signals between computers, PLCs, RTUs, etc.
- L. Uninterruptible Power Supply (UPS): A backup power unit that provides continuous power when the normal power supply is interrupted.
- M. Loop Calibrator: Portable testing and measurement tool capable of accurately generating and measuring 4-20mA DC analog signals.

#### **1.4 SUBMITTALS**

- A. See Section 40 61 13.
- B. Shop Drawings:
  - 1. Table of contents sheet(s).
  - 2. Legend and abbreviation sheets.
  - 3. Panel exterior layout drawings.
  - 4. Panel interior layout drawings.
  - 5. Wiring diagrams.
  - 6. Communication network drawing(s).
  - 7. Bill of Material for each panel.
  - 8. Panel door weight calculation.
  - 9. Electrical load calculations for each panel.
  - 10. Climate control calculations for each panel.
- C. Product Data:
  - 1. Manufacturer catalog cut sheets for enclosure, finish, panel devices, control auxiliaries, and accessories.
- D. Informational Submittals:
  - 1. Unwitnessed Factory Testing confirmation of completion.
  - 2. Record Drawings:
    - a. Updated panel drawings delivered with the panel(s) from the Contractor's factory.
    - b. Drawings shall be enclosed in transparent plastic and firmly secured within each panel.

## 1.5 SUBMITTAL DOCUMENTATION REQUIREMENTS

- A. Shop Drawings:
1. Prepared with computer aided design (CAD) software.
  2. Printed on 11 by 17 IN sheets.
  3. Drawings shall include a title block containing the following:
    - a. Plant or facility name where panel(s) are to be installed.
    - b. Drawing title.
    - c. Drawing number.
    - d. Revision list with revision number and date
    - e. Drawing date.
    - f. Drawing scale.
    - g. Manufacturer name, address, and telephone number.
  4. Cover sheet for each drawing set shall indicate the following:
    - a. Plant or facility name.
    - b. Project name.
    - c. Submittal description.
    - d. Revision number.
    - e. Issue date.
  5. Table of contents sheet(s) shall indicate the following for each drawing in the set:
    - a. Drawing number.
    - b. Drawing title.
    - c. Sheet number.
  6. Legend and abbreviation sheets shall indicate the following:
    - a. Description of symbols and abbreviations used.
    - b. Panel construction notes including enclosure NEMA rating, finish type and color, wire type, wire color strategy, conductor sizes, and wire labeling strategy.
    - c. Confirmation that the panel(s) are to be affixed with a UL 508A or UL 698A label prior to shipment from the factory.
  7. Bill of Material for each panel shall include the following component information:
    - a. Instrument tag number.
    - b. Quantity.
    - c. Functional name or description.
    - d. Manufacturer.
    - e. Complete model number.
    - f. Size or rating.
  8. Panel exterior layout drawings to scale and shall indicate the following:
    - a. Panel materials of construction, dimensions, and total assembled weight.
      - 1) All dimensions shall be in inches.
    - b. Panel access openings.
    - c. Conduit access locations.
      - 1) Ensure conduit entry locations allow for sufficient bend radius of field cables entering enclosure.
      - 2) Control panel exterior layout shall identify conduit and cable entry locations.
    - d. Front view, side views and top view of enclosure.
    - e. Front panel device layout.
    - f. Nameplate schedule:
      - 1) Nameplate location.
      - 2) Nameplate dimensions.
      - 3) Legend which indicates text, letter height and color, background color and nameplate material.
      - 4) Include exterior legends as per UL requirements.
      - 5) Short Circuit Current Rating (SCCR) marking per NFPA 70 or statement of exception. Include any required calculations.
    - g. Layouts of graphic panels or mosaic displays.

- h. Include a statement on the drawings that indicates that the panel has been built as per UL508A or UL698A standards.
- 9. Panel interior layout drawings shall be drawn to scale and shall indicate the following:
  - a. Sub-panel or mounting pan dimensions.
    - 1) All dimensions shall be in inches.
  - b. Interior device layouts indicating dimensioned location of devices.
  - c. Wire-way locations, purpose, and dimensions. Include center line dimensions for all DIN rail and wire-way.
  - d. Terminal strip designations.
  - e. Location of external wiring and/or piping connections.
  - f. Location of lighting fixtures, switches and receptacles.
  - g. Include interior legends as per UL requirements.
- 10. Wiring diagrams shall consist of the following:
  - a. Panel power distribution diagrams.
  - b. Control and instrumentation wiring diagrams.
  - c. Internal network connections diagram
  - d. Wiring diagrams shall identify each wire as it is to be labeled.
  - e. Wiring diagrams shall include line/ rung references.
  - f. Relay coils and their associated contacts shall be cross referenced to each other and clearly identified on the drawings.
  - g. Wires leaving the sheet shall clearly indicate the continuation sheet and line/ rung references.
- 11. Communication network drawing(s) shall include:
  - a. Network equipment
  - b. Interconnections between all network equipment within the panel.
  - c. Connection to the plant network.
- B. Verify that panel door mounted equipment will not exceed the maximum allowed weight as per manufacturer's specification.
  - 1. Submit panel door weight calculation. Include weight of computer if using a laptop shelf.
- C. Electrical load calculations for each panel:
  - 1. Panel current draw based on connected load.
  - 2. SSCR Calculations.
  - 3. UPS Run time calculations.
  - 4. DC power supply load calculations.
  - 5. Climate control calculations for each panel.
  - 6. Verify that sufficient dissipation and/or generation of heat is provided to maintain interior panel temperatures within the rated operating temperatures of panel components.
  - 7. Submit control panel heat release calculations (Watts or BTU/HR). Verify results with cooling/heating software. Submit heating and/or cooling equipment as required. Refer to Section 2.1.
  - 8. Provide temperature monitoring switch when an air conditioner is required by heat release calculations. High Temperature switch shall be wired to a PLC discrete input for temperature monitoring.
  - 9. Provide temperature monitoring switch when heater is required by heat release calculations. Low temperature switch shall be wired to a PLC discrete input for temperature monitoring.
  - 10. Air conditioners shall have built-in temperature display.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Enclosures:
    - a. Hoffman Engineering Co.



- b. Hammond Manufacturing.
  - c. Saginaw Control and Engineering.
  - d. Rittal
  - e. Or approved equal.
- 2. Panel heaters:
  - a. Hoffman Enclosures, Inc.
  - b. Hammond Manufacturing.
  - c. Rittal
  - d. Or approved equal.
- 3. Heat exchangers and air conditioners:
  - a. Hoffman Engineering Co.
  - b. Hammond Manufacturing.
  - c. Saginaw Control and Engineering.
  - d. Rittal
  - e. Pfannenberger.
  - f. Kooltronic
  - g. Or approved equal.
- 4. Cooling fans and exhaust packages:
  - a. Hoffman Enclosures, Inc.
  - b. Hammond Manufacturing.
  - c. Saginaw Control and Engineering.
  - d. Rittal
  - e. Or approved equal.
- 5. Internal corrosion inhibitors:
  - a. Hoffman Enclosures, Inc.; Model A-HCI10E
  - b. Northern Technologies International Corporation (NTIC); Model Zerust VC.
  - c. Cortec Corporation; Model VpCI Emitting Systems.
  - d. Or approved equal.

## 2.2 ACCESSORIES

- A. Panel Nameplates and Identification:
  - 1. See Section 10 14 00.
- B. Free standing enclosures containing a PLC shall be provided with an interior swing out shelf for laptop computers.
- C. Enclosures shall be provided with print pocket mounted on the interior of the door. Free standing enclosures shall have a minimum size print pocket of 12 inches.
- D. All field instrument enclosure penetrations shall be plugged using threaded conduit plugs to prevent water or contaminant entry into the enclosure during installation.
  - 1. Instruments shall maintain manufacturer's rating for the appropriate area designation.
  - 2. Tape and/or plastic plugs shall not be an acceptable means of preventing water/contaminate intrusion.

## 2.3 FABRICATION

- A. General:
  - 1. Fabricate panels with instrument arrangements and dimensions identified in the Contract Documents.
  - 2. Provide panel(s) with the required enclosure rating per NEMA 250 to meet classifications identified in the Contract Documents.
  - 3. Devices installed in panel openings shall have a NEMA enclosure rating at least equal to the panel enclosure rating.
    - a. Devices that cannot be obtained with an adequate NEMA rating shall be installed behind a transparent viewing window.
    - b. The window shall maintain the required NEMA rating of the enclosure.

4. Externally mounted components including but not limited to air conditioners, enclosed transformers, external disconnect switches and external surge protector boxes shall match the NEMA rating and be constructed of the same material as the control panel. As an illustrative example, a NEMA 3/3R external enclosed transformer shall not be mounted on a NEMA 4X stainless steel panel.
5. Panel(s) shall be completely assembled at the Contractor's factory.
  - a. No fabrication other than correction of minor defects or minor transit damage shall be performed on panels at the jobsite.
6. Painting:
  - a. Panels fabricated from steel shall have their internal and external surfaces prepared, cleaned, primed, and painted.
    - 1) Mechanically abrade all surfaces to remove rust, scale, and surface imperfections.
    - 2) Provide final surface treatment with 120 grit abrasives or finer, followed by spot putty to fill all voids.
    - 3) Utilize solvent or chemical methods to clean panel surfaces.
    - 4) Apply surface conversion of zinc phosphate prior to painting to improve paint adhesion and to increase corrosion resistance.
    - 5) Electrostatically apply polyester urethane powder coating to all inside and outside surfaces.
    - 6) Bake powder coating at high temperatures to bond coating to enclosure surface.
      - a) Panel interior shall be white with semi-gloss finish.
      - b) Panel exterior shall be ANSI #61 gray with flat finish.
    - 7) Application of alkyd liquid enamel coating shall be allowed in lieu of polyester urethane powder for wall mounted NEMA 1 or NEMA 12 rated panels.
  - b. Panels fabricated from stainless steel, aluminum, or fiberglass shall not be painted.
7. Finish opening edges of panel cutouts to smooth and true surface conditions.
  - a. Panels fabricated from steel shall have the opening edges finished with the panel exterior paint.
8. Panels shall meet all requirements of UL 508A or UL 698A.
  - a. If more than one disconnect switch is required to disconnect all power within a panel or enclosure, provide a cautionary marking with the word "CAUTION" and the following or equivalent, "Risk of Electric Shock-More than one disconnect switch required to de-energize the equipment before servicing."
9. Provide control panel in accordance with NFPA 70, Article 409.
  - a. In the event of any conflict between NFPA 70, Article 409 and UL 508A or UL 698A, the more stringent requirement shall apply.
10. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
  - a. Determine the SCCR rating by one of the following methods:
    - 1) Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
    - 2) Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
    - 3) Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
  - b. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the control panel circuit originates.
  - c. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

**B. Free-Standing Panels:**

1. Welded construction.
2. Completely enclosed, self-supporting, and gasketed, dust-tight.
3. Rolled lip around all sides of enclosure door opening.
4. Seams and corners welded and ground smooth to touch and smooth in visual appearance.
5. Full height, fully gasketed flush pan doors.

6. Full length piano hinges rated for 1.5 times door plus instrument weight.
  7. Doors with keyed alike locking handles and three-point catch.
  8. Appropriate conduit, wiring, and instrument openings shall be provided.
  9. Lifting eyebolts to allow simple, safe rigging and lifting of panel during installation.
- C. Wall Mounted Panels:
1. Seams continuously welded and ground smooth.
  2. Rolled lip around all sides of enclosure door opening.
  3. Gasketed dust tight.
  4. Three-point latching mechanism operated by oil tight key-locking handle.
  5. Key doors alike.
  6. Continuous heavy GA hinge pin on doors.
    - a. Hinges rated for 1.5 times door plus instrument weight.
  7. Front full opening door.
  8. Brackets for wall mounting.
- D. Internal Panel Wiring:
1. Panel wire duct shall be installed between each row of components, and adjacent to each terminal strip.
    - a. Route wiring within the panel in wire-duct neatly tied and bundled with tie wraps.
    - b. Size wire ducts to include a minimum of 20% spare fill capacity.
    - c. Wire-duct shall have removable snap-on covers and perforated walls for easy wire entrance.
    - d. Wire-duct shall be constructed of nonmetallic materials with rating in excess of the maximum voltage carried therein.
  2. Lay out panel wire-duct on both sides of each terminal strip. Leave one wire-duct empty, so the field wiring has sufficient room for entry into the panel through this wire-way. Designate the other wire-duct for panel wiring.
  3. Wiring shall be installed such that if wires are removed from one device, source of power will not be disrupted to other devices.
  4. "Daisy-chaining" of ground cables or power neutrals between equipment is not permitted.
  5. Terminate all internal wiring with no more than two (2) conductors per terminal block point. For terminal strips designated for field wiring, only one side of the terminal strip shall be used for panel wiring.
  6. Splicing and tapping of wires permitted only at terminal blocks.
  7. Wire bundles to doors shall be secured at each end so that bending or twisting will be around longitudinal axis of wire.
    - a. Protect bend area with sleeve.
  8. Arrange wiring neatly, cut to proper length, with surplus wire removed.
    - a. Arrange wiring with sufficient clearance.
    - b. Provide abrasion protection for wire bundles that pass through openings or across edges of sheet metal.
  9. To eliminate noise coupling or interference, AC power and control circuits shall be routed separate from analog signal cables, low voltage control circuits, and communications cables and digital signal cables.
    - a. Separate by at least 6 IN, except at unavoidable crossover points and at device terminations.
    - b. All wiring shall be bundled and supported by straps.
  10. Wiring to pilot devices or rotary switches shall be individually bundled and installed with a "flexible loop" of sufficient length to permit the component to be removed from panel for maintenance without removing terminations.
  11. Conductors for AC and DC circuits shall be type MTW stranded copper listed for operation with 600 V at 90 DEGC.
    - a. Conductor size shall be as required for load and 16 AWG minimum.
    - b. Internal panel wiring color code:
      - 1) AC circuits:
      - a) Power wiring: Black.

- b) Control interconnections: Red.
    - c) Neutral: White.
    - d) Ground: Green.
  - 2) Low voltage DC circuits:
    - a) Power wiring: Dark Blue(+) and White with Blue stripe.
    - b) Control interconnections: Dark Blue.
  - 3) Foreign voltage circuits: Yellow.
  - 4) Annunciator circuits: Red.
- 12. Analog signal cables shall be of 600 V insulation, stranded copper, twisted-shielded pairs.
  - a. Conductor size: 18 AWG minimum within panel, 16 AWG outside of panel.
  - b. Terminate shield drain conductors to ground only at one end of the cable.
- 13. High precision 250 ohm resistors with 0.25 % accuracy shall be used where 4 - 20 mA DC analog signals are converted to 1 - 5 VDC signals.
  - a. Resistors located at terminal strips.
  - b. Resistors terminated using individual terminal blocks and with no other conductors.
  - c. Resistor leads shall be un-insulated and of sufficient length to allow test or calibration equipment (e.g., HART communicator, loop calibrator) to be properly attached to the circuit with clamped test leads.
- 14. Analog signals for devices in separate enclosures shall not be wired in series.
  - a. Loop isolators shall be used where analog signals are transmitted between control enclosures.
- 15. Wire and cable identification:
  - a. Wire and cables numbered and tagged at each termination.
  - b. Wire tags:
    - 1) See Section 10 14 00 - Identification Devices.
- E. Grounding Requirements:
  - 1. Equipment grounding conductors shall be separated from incoming power conductors at the point of entry.
  - 2. Minimize grounding conductor length within the enclosure by locating the ground reference point as close as practical to the incoming power point of entry.
  - 3. Bond electrical racks, chassis and machine elements to a central ground bus.
    - a. Nonconductive materials, such as paint, shall be removed from the area where the equipment contacts the enclosure.
  - 4. Bond the enclosure to the ground bus. Bonded connections shall be free of paint and debris.
  - 5. It is imperative that good electrical connections are made at the point between the ground bus and enclosure.
  - 6. Panel-mounted devices shall be bonded to the panel enclosure or the panel grounding system by means of locknuts or pressure mounting methods.
  - 7. Sub-panels and doors shall be bonded to ground.
- F. Termination Requirements:
  - 1. Wiring to circuits external to the panel connected to interposing terminal blocks.
  - 2. Terminal blocks rigidly mounted on DIN rail mounting channels.
  - 3. Electrical connections to terminal blocks shall be terminated with a proper torque tool as per manufacturer terminal block instructions. Terminating conductors without a torque tool can result in improper and unsafe installation.
  - 4. Terminal strips located to provide adequate space for entrance and termination of the field conductors.
  - 5. One side of each strip of terminal blocks reserved exclusively for the termination of field conductors.
  - 6. Terminal block markings:
    - a. Marking shall be the same as associated wire marking.
    - b. Legible, machine-printed markings.
    - c. Markings as identified in the shop drawings.
    - d. Terminal block markings shall follow a consecutive numbering sequence. Terminal block numbers with a random numbering sequence are not acceptable.

7. Terminal block mechanical characteristics, and electrical characteristics shall be in accordance with NEMA ICS 4.
8. Terminal blocks with continuous marking strips.
  - a. Each terminal block shall be identified with machine printed labels.
9. Terminals shall facilitate wire sizes as follows:
  - a. 120 VAC applications: Conductor size 12 AWG minimum.
  - b. Other: Conductor size 14 AWG minimum.
10. Analog signal cable shield drain conductors shall be individually terminated.
11. Install minimum of 20 % spare terminals.
12. Fused terminal blocks shall be used in the following circuits:
  - a. Control voltage is used to energize a solenoid valve.
  - b. DC power is connected to 2-wire, loop-powered instruments.
13. Fused terminal blocks shall be provided with blown fuse indicators.
14. When control circuits require more than one field conductor connected to a single wiring point, a sufficient number of terminal points shall be connected internally to allow termination of only one field conductor per terminal block.
15. DIN rail mounting channels shall be installed along full length of the terminal strip areas to facilitate future expansion.
16. Connections to devices with screw type terminals shall be made using spade-tongue, insulated, compression terminators.

G. Component Mounting and Placement:

1. Components shall be installed per manufacturer instructions.
2. Mount and wire so removal or replacement may be accomplished without interruption of service to adjacent devices.
3. Locate all devices mounted inside enclosures so terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.
4. Control relays and other control auxiliaries shall be mounted on DIN rail mounting channels where practical.
5. Front panel devices shall be mounted within a range of 40 to 70 IN above the finished floor, unless otherwise shown in the Contract Documents.
6. PLC/RTU and I/O rack installation:
  - a. Located such that the LED indicators and switches are readily visible with the panel door open.
  - b. Located such that repair and/or replacement of component can be accomplished without the need to remove wire terminations or other installed components.
7. Locate power supplies with sufficient spacing for circulation of air.
8. Where components such as magnetic starters, contactors, relays, and other electromagnetic devices are installed within the same enclosure as the PLC/RTU system components, provide a barrier of at least 6 IN of separation between the "power area containing the electromagnetic devices" and the "control area".
9. Components mounted in the panel interior shall be fastened to an interior sub-panel using machine screws.
  - a. Fastening devices shall not project through the outer surface of the panel enclosure.
10. Excess mounting space of at least 20 % for component types listed below to facilitate future expansion:
  - a. Fuse holders.
  - b. Circuit breakers.
  - c. Control relays.
  - d. Time delay relays.
11. Components installed on sub-panels shall be provides with a minimum spacing between component and wire duct of 1 IN.
  - a. Minimum of 2 IN separation between terminal strips and wire ducts.

H. Power Distribution:

1. Control panels powered by voltage greater than 120 VAC (nominal) main incoming power shall be provided with a disconnect switch mounted within the enclosure.

- a. Disconnect switch shall be interlocked with the enclosure door(s).
  - b. Disconnect switches that supply motor loads shall comply with NEC Code part IX of article 430.
- 2. Main incoming power circuits shall be protected with a thermal magnetic circuit breaker.
  - a. Limit load to maximum of 80 % of circuit breaker rating.
- 3. Component types listed below shall be individually fused so that they may be individually de-energized for maintenance:
  - a. Operator interface terminals/HMI.
  - b. DC power supplies.
- 4. Equip each panel with necessary power supplies with ratings required for installed equipment and with minimum 25 % spare capacity.
- 5. Constant voltage transformers, balancing potentiometers, and rectifiers as necessary for specific instrument requirements.
- 6. Circuit breakers and fuses shall be used to protect equipment powered inside and outside enclosure
  - a. Circuit breakers shall be UL489.
  - b. UL489 circuit breaker shall be finger safe.
  - c. Fuses shall be 1/4 x 1-1/4 IN size.
- I. Internal Panel Lighting and Service Receptacles:
  - 1. Panels less than or equal to 4 FT wide:
    - a. One electrical GFCI duplex receptacle.
    - b. One LED light fixture with manual switch(es).
  - 2. Panels or panel faces greater than 4 FT wide:
    - a. One duplex electrical GFCI receptacle per 6 FT of length.
    - b. Continuous LED lighting strip with manual switches.
- J. Security Controls:
  - 1. Provide all control panels and enclosures with door switch monitored by discrete input utilizing normally closed contacts.
  - 2. Configure door switch as an alarm at the HMI.
- K. Environmental Controls:
  - 1. Indoor panels located in a designated electrical room or control room:
    - a. Thermostat controlled cooling fans with exhaust louvers if required to maintain temperature inside panel(s) below the maximum operating temperature rating of the internal components.
    - b. Internal corrosion inhibitors.
  - 2. Indoor panels not located within a designated electrical room or control room:
    - a. Thermostat controlled heaters to maintain temperature approximately 10 DEGF above ambient for condensation prevention inside the panels.
    - b. Automatically controlled, closed-loop heat exchangers or closed-loop air conditioners where required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the panel(s).
    - c. Internal corrosion inhibitors.
  - 3. Outdoor panels:
    - a. Outdoor temperature range of 0 DEGF through 120 DEGF.
    - b. Thermostat controlled heaters to maintain temperature approximately 10 DEGF above ambient dew point for condensation prevention inside the panels.
    - c. Thermostat controlled closed-loop heat exchangers or closed-loop air conditioners if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the panel.
    - d. Internal corrosion inhibitors.
  - 4. Environmental control components:
    - a. Panel heaters:
      - 1) Thermostat controlled.
      - 2) Fan driven.

- 3) Components mounted in an anodized aluminum housing.
- 4) Designed for sub-panel mounting.
- 5) Powered from 120 VAC and protected with a dedicated circuit breaker.
- b. Cooling fans and exhaust packages:
  - 1) Cooling fan with louver or grill and replaceable filter.
  - 2) Designed to be mounted within a panel cutout to provide positive airflow through the panel.
  - 3) Cooling fan and exhaust louvers shall be designed and listed to maintain a NEMA 12 enclosure rating.
  - 4) Fitted with replaceable, high-density foam or synthetic fiber.
  - 5) Cooling fan controlled with a separately mounted thermostat with bi-metal sensor and adjustable dial for temperature setting.
  - 6) Powered from 120 VAC and protected with a dedicated circuit breaker.
- c. Heat exchangers and air conditioners:
  - 1) Dual-loop design to isolate panel interior air from exterior air.
  - 2) Thermostat controlled.
  - 3) Operate from 120 VAC and protected with a dedicated circuit breaker.
- d. Internal corrosion inhibitors:
  - 1) Contains chemical which vaporizes and condenses on surfaces in the enclosure.
  - 2) Inhibitor shall be applied in accordance with manufacturer instructions for the enclosure volume.
  - 3) Inhibitor shall be applied in the panel(s) prior to shipment from the Contractor's factory.

## **2.4 UNWITNESSED FACTORY TESTING**

- A. Inspect and test entire panel assembly to verify readiness for shipment. or readiness for the Engineer and/or Owner to attend factory testing if specified in Section 40 61 21 - Process Control System Testing.
- B. Location: Panel fabricator's factory.
- C. Tests shall be fully documented and signed by the panel fabricator's factory supervisor.
- D. The panel shop shall fully test the control panel for correct wiring.
  1. Each I/O point shall be checked by measuring or connecting circuits at the field terminal blocks.
- E. Burn-in test: Panel(s) shall be fully energized for a minimum period of 48 HRS.
- F. Testing equipment (such as digital multi-meters, analog loop calibrators, and laptop computers with PLC programming software) shall be used as required for testing.
- G. The following functions shall be tested as a minimum:
  1. Verify functions of the panel(s) required by the Contract Documents.
  2. Correctness of wiring from all panel field terminals to all I/O points and to all panel components.
  3. Simulate and test each discrete signal at the field terminal strips.
  4. Simulate and test each analog signal using loop calibrators.
  5. Verify online and offline diagnostic tests and procedures.
- H. Deficiencies shall be corrected prior to requesting the Engineer and/or Owner to attend factory testing if specified, or prior to shipment from the Contractor's factory.

## **2.5 FACTORY ACCEPTANCE TESTING**

- A. Perform Factory Acceptance Testing witnessed by the Owner and/or Engineer if specified in Section 40 61 21 - Process Control System Testing.

## **2.6 MAINTENANCE MATERIALS**

- A. Extra Materials:

1. Quantity of 25 % replacement lamps for each type installed (minimum of 12 of each type).
2. Minimum 12 replacement filters for each type installed.
3. 1 QT of exterior finish touch-up paint.
4. One complete set of replacement corrosion inhibitors in sealed packages for each panel.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install freestanding panels on 4 IN high concrete housekeeping pads.
- B. Anchor panels in a manner to prevent the enclosure from racking, which may cause the access doors to become misaligned.
- C. Obtain approved panel layouts prior to installation of conduits.
- D. Install products in accordance with manufacturer's instructions.

### **END OF SECTION**



**SECTION 40 78 00**  
**PANEL MOUNTED INSTRUMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Signal modules:
    - a. Loop isolator.
    - b. Potentiometer transmitter.
  - 2. Pilot devices:
    - a. Selector switches.
    - b. Pushbuttons.
    - c. Indicating lights.
    - d. Potentiometer.
  - 3. Relays/timers:
    - a. Control relay.
    - b. Time delay relays.
  - 4. Termination equipment:
    - a. Terminal blocks.
    - b. Fuse holders.
  - 5. Power supplies:
    - a. DC power supplies.
  - 6. Voltage surge protection devices.
  - 7. Running time indicator.
- B. Related Sections include but are not necessarily limited to:
  - 1. Section 26 43 13 - Surge Protection Devices for Low-Voltage Electrical Power Circuits.
  - 2. Section 40 61 13 - Process Control Systems General Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. The International Society of Automation (ISA):
    - a. S18.1, Annunciator Sequences and Specifications.
    - b. ANSI/ISA-12.02.02-2014, Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings.
  - 2. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
- B. Miscellaneous:
  - 1. Assure units comply with electrical area classifications and NEMA enclosure type shown on Drawings.

**1.3 SUBMITTALS**

- A. Shop Drawings:
  - 1. Control Drawings for intrinsically safe systems:
    - a. Print on 8-1/2 x 11 IN sheets.
    - b. In accordance with recommendations of ANSI/ISA-12.02.02-2014.
    - c. One control drawing per sheet.
    - d. Identify model numbers of both the associated apparatus and the intrinsically safe apparatus.

- e. Include wiring diagram showing interconnections of the intrinsically safe apparatus and the associated apparatus.
- f. Provide entity parameters for both the associated apparatus and the intrinsically safe apparatus.
- g. Identify line of demarcation between classified (hazardous) and unclassified (nonhazardous) locations and identify equipment that is installed in each location.
- h. Identify hazardous areas by class, groups, and divisions.
- i. Show maximum nonhazardous location voltage that may be used with the associated apparatus.
- j. Include any specific conditions that are necessary to maintain the intrinsic safety protection.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.
- B. Provide similar components from the same manufacturer for uniformity of appearance, operations, and maintenance.

### **2.2 ANNUNCIATORS – NOT USED**

### **2.3 PILOT DEVICES**

- A. Selector Switches:
  - 1. Manufacturers:
    - a. Eaton.
    - b. Rockwell Automation (Allen-Bradley).
    - c. Schneider Electric.
    - d. GE.
    - e. Siemens.
  - 2. Design and fabrication:
    - a. Heavy-duty type.
    - b. NEMA 4.
    - c. Rotary cam units conforming to NEMA ICS 2-216.22.
    - d. Mounting hole: 30.5 MM.
    - e. Supply switches having number of positions required with contact blocks to fulfill functions shown and specified.
    - f. UL listed.
    - g. Maintained contact type.
    - h. Knob type operators.
    - i. Black colored operators.
    - j. Designed with cam and contact block with approximate area of 2 IN SQ.
    - k. Legend plate marked per Contract Documents.
    - l. Contact block requirements:
      - 1) Dry and indoor locations: Standard contact blocks rated for 10 A continuous current.
      - 2) Wet or outside locations: Hermetically sealed contact blocks.
- B. Pushbuttons:
  - 1. Manufacturers:
    - a. Eaton.
    - b. Rockwell Automation (Allen-Bradley).
    - c. Schneider Electric.
    - d. GE.
    - e. Siemens.

2. Materials:
    - a. Backing diaphragm: Buna-N.
  3. Design and fabrication:
    - a. Heavy-duty type.
    - b. NEMA 4.
    - c. Conforming to NEMA ICS 2-216.22.
    - d. Mounting hole: 30.5 MM.
    - e. Diaphragm backed.
    - f. UL listed.
    - g. Emergency stop pushbuttons to have mushroom head operator and two sets of maintained normally open (NO) and normally closed (NC) contacts. Emergency stop pushbutton shall be NEMA 4X rated and pad-lockable.
    - h. Non-illuminated type:
      - 1) Momentary contact with necessary contact blocks.
      - 2) Molded, solid color melamine buttons.
      - 3) Standard flush operators with full shroud.
      - 4) Red colored buttons for START or ON and green color for STOP or OFF.
      - 5) Appropriate contact blocks to fulfill functions shown or specified.
    - i. Contact block requirements:
      - 1) Dry and indoor locations: Standard contact blocks rated for 10 A continuous current.
      - 2) Wet or outside locations: Hermetically sealed contact blocks.
      - 3) Legend plate marked per Contract Documents.
    - j. Illuminating type:
      - 1) Momentary contact with necessary contact blocks.
      - 2) Serves as both pushbutton control and indicating light.
      - 3) Red colored lenses for start or on and green for STOP or OFF.
      - 4) Resistor-type full voltage light unit with lens and panel gasket.
      - 5) Legend plate marked per Contract Documents.
      - 6) Appropriate contact blocks to fulfill functions shown or specified.
- C. Indicating Lights:
1. Manufacturers:
    - a. Eaton.
    - b. Rockwell Automation (Allen-Bradley).
    - c. GE.
    - d. Siemens.
  2. Design and fabrication:
    - a. Heavy duty.
    - b. NEMA 4.
    - c. Type allowing replacement of bulb without removal from control panel.
    - d. LED.
    - e. UL listed.
    - f. 24 V lamp.
    - g. Legend plate marked per Contract Documents.
    - h. Nominal 2 IN SQ face.
    - i. Mounting hole: 30.5 MM.
    - j. Push-to-test indicating lights.
    - k. Plastic lens.
    - l. Color code lights as follows:
      - 1) Green: OFF or stopped; valve closed.
      - 2) Amber: Standby; auto mode; ready.
      - 3) Red: ON or running; valve open.
- D. Potentiometer:
1. Manufacturers:
    - a. Eaton.

- b. Allen-Bradley.
- 2. Design and fabrication:
  - a. Heavy-duty, NEMA type.
  - b. Mounting hole: 30.5 MM.
  - c. UL listed.
  - d. Linear adjustment through 0-1000 ohms with 1% resolution.
  - e. 3-wire interface.
  - f. Dial plate with 0-100% scale.
  - g. Panel mounted.
  - h. One-turn adjustment knob.

## 2.4 RELAYS/TIMERS

- A. Control Relays:
  - 1. Manufacturers:
    - a. Idec.
    - b. TE Connectivity (Potter & Brumfield).
    - c. Rockwell Automation (Allen-Bradley)
    - d. Eaton.
  - 2. Design and fabrication:
    - a. Plug-in general purpose relay.
    - b. Blade connector type.
    - c. Switching capacity: 10 A.
    - d. Contact material: Silver cadmium oxide.
    - e. Provide relays with a minimum of 2 DPDT contacts.
    - f. Coil voltage: 120 VAC.
    - g. Relay sockets are DIN rail mounted.
    - h. Internal neon or LED indicator is lit when coil is energized.
    - i. Clear polycarbonate dust cover with clip fastener.
    - j. Check button.
    - k. Temperature rise:
      - 1) Coil: 85 DEGF max.
      - 2) Contact: 65 DEGF max.
    - l. Insulation resistance: 100 Meg min.
    - m. Frequency response: 1800 operations/hour.
    - n. Operating temperature: -20 to +150 DEGF.
    - o. Life expectancy:
      - 1) Electrical: 500,000 operations or more.
      - 2) Mechanical: 50,000,000 operations or more.
    - p. UL listed.
- B. Time Delay Relays:
  - 1. Manufacturers:
    - a. Rockwell Automation (Allen Bradley).
    - b. Idec.
    - c. Eaton.
  - 2. Design and fabrication:
    - a. Melt design test and performance requirements of NEMA ICS 2-218.
    - b. Heavy-duty.
    - c. Solid-state construction.
    - d. DPDT contacts.
    - e. External adjusting dial.
    - f. Auxiliary relays as required to perform functions specified or shown on Drawings.
    - g. Operates on 117 VAC ( $\pm 10\%$ ) power source.
    - h. Contact rating: A150 per NEMA ICS 2-125.
    - i. Furnish with "on" and "timing out" indicators.

## 2.5 TERMINATION EQUIPMENT

### A. Terminal Blocks:

1. Manufacturers:
  - a. Phoenix Contact.
  - b. Rockwell Automation (Allen-Bradley).
  - c. Weidmuller.
2. Design and fabrication:
  - a. Modular type with screw compression clamp.
  - b. Screws: Stainless steel.
  - c. Current bar: Nickel-plated copper alloy.
  - d. Thermoplastic insulation rated for -40 to +90 DEGC.
  - e. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
  - f. Install end sections and end stops at each end of terminal strip.
  - g. Install machine-printed terminal markers on both sides of block.
  - h. Spacing: 6 MM.
  - i. Wire size: 22-12 AWG.
  - j. Rated voltage: 600 V.
  - k. Din rail mounting.
  - l. UL listed.
3. Standard-type block:
  - a. Rated current: 30 A.
  - b. Color: Gray body.
4. Bladed-type block:
  - a. Terminal block with knife blade disconnect which connects or isolated the two (2) sides of the block.
  - b. Rated current: 10 A.
  - c. Color:
    - 1) Panel control voltage leaves enclosure - normal: Gray body, orange switch.
    - 2) Foreign voltage entering enclosure: Orange body, orange switch.
5. Grounded-type block:
  - a. Electrically grounded to mounting rail.
  - b. Use to terminal ground wires and analog cable shields.
  - c. Color: Green and yellow body.

### B. Fuse Holders:

1. Manufacturers:
  - a. Phoenix Contact.
  - b. Rockwell Automation (Allen-Bradley).
  - c. Weidmuller.
  - d. Eaton.
2. Design and fabrication:
  - a. Modular-type with screw compression clamp.
  - b. Screws: Stainless steel.
  - c. Current bar: Nickel-plated copper alloy.
  - d. Thermoplastic insulation rated for -40 to +105 DEGC.
  - e. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
  - f. Blocks can be ganged for multi-pole operation.
  - g. Install end sections and end stops at each end of terminal strip.
  - h. Install machine-printed terminal markers on both sides of block.
  - i. Spacing: 9.1 MM.
  - j. Wire size: 30-12 AWG.
  - k. Rated voltage: 300 V.
  - l. Rated current: 12 A.
  - m. Fuse size: 1/4 x 1-1/4.
  - n. Blown fuse indication.
  - o. DIN rail mounting.

- p. UL listed.

## **2.6 POWER SUPPLIES**

- A. DC Power Supplies:
  - 1. Manufacturers:
    - a. Sola Hevi-Duty.
    - b. Phoenix Contact.
    - c. Rockwell Automation.
  - 2. Design and fabrication:
    - a. Converts 120 VAC input to DC power at required voltage.
    - b. DIN rail mount with enclosure (i.e., not open frame).
    - c. Switching type.
    - d. Provide redundant 24VDC modules with diode redundancy module for automatic switchover to standby module on failure of primary module.
    - e. Hardwire module fault dry contact to associated PLC input for alarm at Plant SCADA.
    - f. AC input: 120 VAC  $\pm 15\%$ , nominal 60 Hz.
    - g. Efficiency: Minimum 86%.
    - h. Rated mean time between failure (MTBF): 500,000 HRS.
    - i. Voltage regulation:
      - 1) Static: Less than 1.0%  $V_{out}$ .
      - 2) Dynamic:  $\pm 2\%$   $V_{out}$  overall.
    - j. Output ripple/noise: Less than 100 mV peak to peak (20 MHz).
    - k. Overload, short circuit and open circuit protection.
    - l. Temperature rating: 0 to 60 DEGC full rated, derated linearly to 50% at 70 DEGC.
    - m. Humidity rating: Up to 90%, non-condensing.
    - n. LED status indication for DC power.
    - o. UL listed.

## **2.7 VOLTAGE SURGE PROTECTION DEVICES**

- A. See Specification Section 26 43 13.

## **2.8 RUNNING TIME INDICATORS**

- A. Acceptable Manufacturer:
  - 1. Eagle Signal Controls.
- B. Design and Fabrication:
  - 1. Six-digit wheels including a 1/10 digit.
  - 2. Non-reset type.
  - 3. Time range in hours.
  - 4. Automatic recycle at zero.
  - 5. Accuracy: 1%.
  - 6. Sealed against dirt and moisture.
  - 7. Tamper-proof.

**2.9 INSTRUMENT AIR COMPRESSOR – NOT USED**

**2.10 CLOCKS – NOT USED**

**2.11 INTRINSIC SAFETY ISOLATORS – NOT USED**

**2.12 ALARM BEACONS – NOT USED**

**2.13 HORNS – NOT USED**

**2.14 ALARM DIALER: - NOT USED**

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Mount adder/subtractors, multiplier/dividers, square root extractors, transducers and program timers on separate subpanel in control panel.
- C. Instrument Air Compressors:
  - 1. Pipe condensate outside panel to nearest floor drain.
  - 2. Mount compressors with rubber vibration isolators.

**END OF SECTION**





**SECTION 43 21 00**  
**PUMPING EQUIPMENT: BASIC REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pumping equipment.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. Hydraulic Institute (HI):
    - a. 9.6.4, Rotodynamic Pumps for Vibration Measurements and Allowable Values.
    - b. 11.6, Rotodynamic Submersible Pump for Hydraulic Performance, Hydrostatic Pressure, Mechanical, and Electrical Acceptance Tests.
    - c. 14.6, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
  - 2. National Sanitation Foundation International (NSF):
    - a. NSF 61 Drinking Water System Components - Health Effects.
- B. Fully coordinate all mechanical seal systems specified to ensure pump and seal compatibility.
- C. Pump/motor and VFD coordination: See Specification Section 01 61 03.

**1.3 DEFINITIONS**

- A. The abbreviations are defined as follows:
  - 1. IPS: Iron Pipe Size.
  - 2. NPSHR: Net Positive Suction Head Required.
  - 3. TDH: Total Dynamic Head.
  - 4. TEFC: Totally Enclosed Fan Cooled.
  - 5. VFD: Variable Frequency Drive.
  - 6. NPSH3: Net Positive Suction Head for 3% head loss.
- B. Pump Service Category: Pump or pumps having identical names (not tag numbers) used for specific pumping service.

**1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. See Specification Section 01 61 03.
  - 3. Product technical data including:
    - a. Performance data and curves with flow (gpm), head (FT), horsepower, efficiency, NPSH requirements, submergence requirement.
    - b. Pump accessory data.
    - c. Bearing supports, shafting details and lubrication provisions.
      - 1) Bearing life calculations.
      - 2) Critical speed calculations.
    - d. Solids passage information.
  - 4. Certifications:
    - a. Certified pump performance curves as described in the SOURCE QUALITY CONTROL Article.
  - 5. Test reports:
    - a. Factory hydrostatic test.
- B. Contract Closeout Information:

1. Operation and Maintenance Data:
  - a. See General Provisions Article 5 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
  1. Certifications:
    - a. Provide a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by Owner's personnel.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  1. Pumps:
    - a. See individual pump Specification Sections.
  2. Mechanical seals:
    - a. Chesterton.
    - b. Garlock.
    - c. Or as noted in the individual pump Specification Sections.

### **2.2 CENTRIFUGAL PUMP DESIGN**

- A. Provide units with increasing head characteristics from the end run out portion of the curve to shut-off condition.

### **2.3 ACCESSORIES**

- A. See Specification Section 01 61 03.
- B. Each Unit:
  1. Lifting eye bolts or lugs.
  2. Plugged gage cock connection at suction and discharge nozzles.
  3. Tapped and plugged openings for casing and bearing housing vents and drains.
  4. Fittings for properly adding flushing lubricant.
  5. Pressure relief fittings for grease lubrication.
- C. Mechanical Seals:
  1. Provide as specified in the narrow-scope pump sections.
  2. Provide rotating balanced O-ring type.
  3. Provide water oil lubrication - cooling.
  4. Materials:
    - a. Metal parts except springs: 316 stainless steel.
    - b. Springs: Hastelloy C.
    - c. Seal faces: Unfilled carbon graphite versus silica-free Grade 99.5 ceramic.
    - d. Elastomers: Viton.

### **2.4 FABRICATION**

- A. Pump Support:
  1. Design base to support weight of drive, shafting and pump.
  2. Comply with HI vibration limitations.
  3. Mount horizontal pump, motor and coupling on single piece drip lip type baseplate.
  4. Mount vertical pumps on single piece pedestal baseplate.
  5. Fabricate to withstand all operating loads transmitted from the pump and drive.

### **2.5 SOURCE QUALITY CONTROL**

- A. Factory hydrostatic test all pumps at 150 percent of shut-off head for a minimum of 5 minutes.
- B. If specifically required in the individual pump specification sections, provide factory tests:

1. All units:
    - a. Conduct tests in accordance with HI.
      - 1) Shut-off head and design condition: Positive unilateral performance tolerance meeting Grade 1U per HI 14.6 for Rotodynamic Pumps.
      - 2) Shut-off head and design conditions: Positive unilateral performance tolerances meeting Grade 1U per HI 11.6 for Rotodynamic Submersible Pumps.
  2. Adjustable speed units:
    - a. Head (FT) verses flow (gpm) pump curves:
      - 1) Maximum, minimum and two (2) equally spaced intermittent speeds.
      - 2) Efficiencies along each curve.
      - 3) Brake horsepower along each curve.
  3. Constant speed units:
    - a. Head (FT) versus flow (gpm) pump curves:
      - 1) Efficiencies along curve.
      - 2) Brake horsepower along each curve.
  4. Results certified by a registered professional engineer.
- C. Statically and dynamically balance each pump per HI standards.
1. If specifically required in the individual pump specification sections or in Specification Section 01 61 03, field vibration test pumps:
    - a. To meet requirements of HI 9.6.4 for Rotodynamic Pumps at any point on the pumps and motor.
- D. To meet requirements of HI 11.6 for Submersible Pumps.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. See Specification Section 01 61 03.
- B. Floor or Pad-Mounted Units:
1. Align vertically and horizontally level, wedge and plumb units to match piping interfaces.
  2. Assure no unnecessary stresses are transmitted to equipment flanges.
  3. Tighten flange bolts at uniform rate and manufacturer's recommended torque for uniform gasket compression.
  4. Support and match flange faces to uniform contact over entire face area prior to bolting pipe flange and equipment.
  5. Permit piping connecting to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.
  6. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.
  7. Assemble connecting piping with gaskets in place and minimum of four (4) bolts per joint installed and tightened.
    - a. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange.
    - b. Realign as necessary, install flange bolts and make equipment connection.
  8. Field paint units as defined in Specification Section 09 96 00.
  9. Provide pressure gage on discharge of all pumps and on suction and discharge of all non-submersible units.
- C. Submersible Units:
1. Assemble connecting piping with gaskets in place and minimum of four (4) bolts per joint installed and tightened.
    - a. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange.
    - b. Realign as necessary, install flange bolts and make equipment connection.
  2. Field paint units as defined in Specification Section 09 96 00.

- D. Provide pressure gage on discharge of all pumps and on suction and discharge of all non-submersible units.
- E. For submersible units, provide discharge pressure gage visible from grade or operating floor.

### **3.2 FIELD QUALITY CONTROL**

- A. Provide services of equipment manufacturer's field service representative(s) to:
  - 1. Inspect equipment covered by this Specification Section.
  - 2. Supervise pre-start adjustments and installation checks.
  - 3. Conduct initial start-up of equipment and perform operational checks.
  - 4. Instruct Owner's personnel for the specified minimum number of hours at jobsite.

**END OF SECTION**

**SECTION 43 25 13**  
**PUMPING EQUIPMENT - SUBMERSIBLE PUMPS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Submersible pumps in a wet pit application for pumping of reclaimed backwash flows.
- B. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 09 96 00 - High Performance Industrial Coatings.
  - 4. Division 26 - Electrical.
  - 5. Section 43 21 00 - Pumping Equipment - Basic Requirements.

**1.2 QUALITY ASSURANCE**

- A. Referenced Standards:
  - 1. American Bearing Manufacturers Association (ABMA).
  - 2. American National Standards Institute (ANSI).
  - 3. ASTM International (ASTM):
    - a. A48, Standard Specification for Gray Iron Castings.
  - 4. FM Global (FM).
  - 5. Hydraulic Institute (HI):
    - a. Standards for Centrifugal, Rotary and Reciprocating Pumps.
  - 6. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 7. National Fire Protection Agency (NFPA):
    - a. 70, National Electrical Code (NEC):
      - 1) Article 500, Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2.
  - 8. Underwriters Laboratories, Inc. (UL).
    - a. 62, Flexible Cord and Fixture Wire.
  - 9. NSF International (NSF):
    - a. 61, Drinking Water System Components – Health Effects.

**1.3 SYSTEM DESCRIPTION**

- A. There are three existing constant speed Flygt submersible pumps which are manually controlled and operate with no backup. The existing pumps shall be replaced with three higher capacity pumps to facilitate a two duty and one standby arrangement at flows specified under Part 2 of this Specification Section. The new pumps shall be provided with variable speed drives and shall be automatically controlled based on Owner specified percentage of plant influent flows.
- B. Provide single source coordination responsibility through the pump manufacturer for the entire system including but not limited to the following:
  - 1. Pumps.
  - 2. Motors.

**1.4 SUBMITTALS**

- A. Shop Drawings:
  - 1. See Special Provision 19 for requirements for the mechanics and administration of the submittal process.
  - 2. Requirements in Specification Section 01 61 03.
  - 3. Requirements in Specification Section 43 21 00.

- B. Operation and Maintenance Manuals:
  - 1. See General Provisions Article 5 for requirements for:
    - a. The mechanics and administration of the submittal process.
    - b. The content of Operation and Maintenance Manuals.
- C. Project Information:
  - 1. Executed Manufacturer's Installation Certification Form.

## **1.5 SHIPPING**

- A. Per Section 01 61 03.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. KSB.
  - 2. Sulzer.
  - 3. Or equal.
- B. Submit request for substitution in accordance with General Provisions Article 5.

### **2.2 PERFORMANCE AND DESIGN REQUIREMENTS**

- A. Reclaimed Backwash System (Decant Pump Station):
  - 1. Shutoff Head (range): 133 FT.
  - 2. Design Condition:
    - a. Flow: 1736 GPM.
    - b. Head: 77 FT.
    - c. Minimum Hydraulic Efficiency: 82 PCT.
    - d. Maximum NPSH3: 20.4 FT.
    - e. Pump BEP shall be within +/- 2% of the design condition flow.
  - 3. Runout Condition:
    - a. Minimum Flow: 2,500 GPM.
    - b. Maximum Head: 45 FT.
    - c. Minimum Hydraulic Efficiency: 70 PCT.
    - d. Maximum NPSH3: 33 FT.
  - 4. Secondary Condition:
    - a. Maximum Flow: 486 GPM.
    - b. Minimum Head: 26 FT.
    - c. Minimum Hydraulic Efficiency: 75 PCT.
    - d. Maximum NPSH3: 4 FT.
  - 5. Suction Diameter: 6 IN.
  - 6. Discharge Diameter: 6 IN.
  - 7. Pump Rotation: Per Drawings.
    - a. Motor requirements:
      - 1) Maximum Operating Speed: 1800 RPM.
      - 2) Minimum Operating Speed: 600 RPM.
      - 3) Service factor: 1.15.
      - 4) Minimum motor efficiency at the Design Condition: 78 PCT.
      - 5) Maximum nameplate horsepower: 60 HP.
    - b. Drive type: Variable speed.
    - c. Ambient conditions:
      - 1) Reclaimed backwash water maximum temperature: 80 DEGF.

## 2.3 MATERIALS

- A. Reclaimed Backwash System (Decant Pump Station):
  - 1. Pump case: Cast iron, ASTM A48, Class 35.
  - 2. Motor housing: Cast iron, ASTM A48, Class 25 or Class 30.
  - 3. Impeller: Cast iron, ASTM A48, Class 30.
  - 4. Shaft: Stainless Steel, Series 300 or 400.
  - 5. Wear Surfaces: Hardened Stainless Steel wear rings with the stationary ring harder than the rotating ring.
  - 6. Suction cover: Cast Iron, ASTM A-532 Class III, Type A.
  - 7. O-rings: Nitrile (Buna-N) or fluorocarbon (Viton).
  - 8. Fasteners: Stainless steel.
  - 9. Lower ring seal: Tungsten-carbide both faces or Silicon Carbide both faces.
  - 10. Upper ring seal: Tungsten-carbide both faces or Silicon Carbide or carbon and ceramic or carbon and Ni-resist.
  - 11. Seal metal parts: Stainless steel.
- B. Wet Pit Applications:
  - 1. Guide rails: Type 316 Stainless steel.
  - 2. Lifting chains and cables: Type 316 Stainless steel.
  - 3. Base elbow: Cast iron, ASTM A48, Class 35.

## 2.4 COMPONENTS

- A. General:
  - 1. Provide pumps capable of handling solids, including grit, from filter waste and backwash process flows.
  - 2. Where watertight sealing is required, machine and fit mating surfaces with O-rings.
  - 3. Provide with heavy duty lift lugs or hoisting bail designed for lifting the entire pump and motor assembly.
- B. Impeller:
  - 1. Provide a multi-channel solids-handling type dynamically balanced impeller in accordance with HI standards.
- C. Shaft:
  - 1. Design shaft for a maximum deflection of 0.004 IN at the stuffing box as calculated at the design condition.
- D. Mechanical Seal:
  - 1. Seal shaft with double mechanical seal running in an oil filled chamber.
  - 2. Provide seals requiring neither routine maintenance nor adjustment, but capable of being easily inspected and replaced.
  - 3. Hold interface in contact by its own spring system.
- E. Bearings:
  - 1. Support shaft on upper and lower permanently lubricated bearings with a minimum ABMA L-10 life of 50,000 HRS.
- F. Motors:
  - 1. Provide pump with FM, UL, or CSA listed motor approved for outdoor wet areas.
  - 2. Provide induction type motor with a squirrel cage rotor, of totally submersible design without loss of watertight integrity to a depth of at least 65 FT, constructed with epoxy or poly-seal encapsulated windings, air-filled or dielectric oil filled, with Class H insulation rated for 180 DEGC and rated for continuous duty operation.
  - 3. Motor shall be 3 PH, 60 Hz, 4 pole.
  - 4. Motor shall be capable of running continuously in an unsubmerged condition while pumping under load without damage to motor or seal.
  - 5. The motor horsepower provided shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through runout.

6. The motor shall be designed and assembled by the same manufacturer as the pump.
  7. The motor shall be equipped with a closed loop cooling system where the cooling medium is circulated through the pump motor cooling jacket. The pumped fluid shall not be circulated through the cooling jacket. An impeller in the lower motor coolant reservoir will circulate coolant around the motor housing. The cooling system shall provide sufficient cooling for continuous operation whether the pump is submerged in the pumped media or surrounded by air in liquid or ambient temperatures of up to 40 DEGC.
  8. Cooling system will provide sufficient cooling for the entire range of pump operating speeds.
- G. Power and Control Cables:
1. Provide power and control cables which are listed per NEC requirements and approved for the installation types indicated on the drawings. As a minimum the cable shall be suitable for installation in conduit and for submersible applications.
  2. Size cables in accordance with applicable NFPA 70 specifications.
  3. Provide power cable and control cable as necessary to provide a fully functional system as shown on the drawings.
  4. Provide each cable with a strain relief, cord grip, and explosion proof seal installed in accordance with NFPA 70, Article 500.
  5. Minimum acceptable cable type: "SO-Water Resistant" per UL 62.
- H. Temperature Monitor:
1. Furnish each phase of the motor with thermal switches embedded in the motor windings.
  2. Should high temperature be sensed in the windings, the thermal switch will open, shut the pump down, and sound an alarm. Should any one of the thermal switches detect high temperature, it will automatically reset once the stator temperature returns to normal.
  3. Set temperature of the temperature monitors not higher than 90 PCT of insulation temperature rating.
- I. Leak Detection:
1. Provide sensors inside the terminal board and the stator chamber to detect water intrusion
  2. If water is detected inside the terminal board or the stator chamber, a switch will stop the pump and sound an alarm.
- J. Coatings:
1. Apply fusion bonded epoxy and NSF 61 certified coating system to the wetted parts on the interior and exterior of the pump and motor.
- K. Wet Pit Applications:
1. Provide sliding guide bracket integral to pump unit which properly aligns the pump discharge with the discharge connection elbow for watertight seal during pumping.
  2. Guide the entire weight of the pumping unit to the base discharge elbow by guide rail(s).
  3. The guide rail(s) shall not support any portion of the weight of the pump.
  4. Provide chains or cable of sufficient strength to lift pumps from sump.
  5. Furnish guiding rail assembly and the discharge flange assembly of nonsparking Duplex stainless steel components.
  6. Design pump to allow for removal without entering the wet well and without removal of bolts, nuts or other fastenings.
  7. Provide pump unit connecting to discharge connection with a simple downward motion without rotation. The entire weight of the pumping unit shall wedge tightly against the discharge elbow flange forming a seal without the use of bolts, gaskets, or o-rings.
  8. Provide necessary sliding guide bracket and discharge connection which, when bolted to the floor of the sump and to the discharge line, will receive the pump discharge connecting flange without need of adjustment, fasteners, clamp, or similar devices.
  9. No portion of the pump shall bear directly on the floor.
- L. Cooling System:
1. Provide an integral, self-supplying cooling system for each pump/motor unit.



## **2.5 ACCESSORIES**

- A. See Specification Section 43 21 00 - Pumping Equipment: Basic Requirements.
- B. Controls:
  - 1. See Electrical and Instrument and Controls Designs for controls requirements.

## **2.6 SOURCE QUALITY CONTROL**

- A. Secure from the pump manufacturer the following inspections and tests on each pump before shipment from factory:
  - 1. Check impeller, motor rating and electrical connections for compliance with this Specification Section.
  - 2. Test motor and cable insulation for moisture content or insulation defects.
  - 3. Prior to submergence, run pump dry to establish correct rotation and mechanical integrity.
  - 4. Run pump submerged for 30 minutes.
  - 5. After 2.6 A.4, perform insulation test of 2.6 A.2 again.
- B. Factory test of head (FT) versus flow (GPM) as specified in Specification Section 43 21 00.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. See Specification Section 43 21 00.
- B. For wet pit pumps, permanently install discharge connection elbow in wet well along with discharge piping.
- C. Seal pump cable end with a high quality protective covering, to make it impervious to moisture or water seepage prior to electrical installation.

### **3.2 FIELD QUALITY CONTROL**

- A. See Specification Section 43 21 00.

## **END OF SECTION**



# REQUEST FOR INFORMATION

## City of Folsom

50 Natoma Street, Folsom, CA 95630  
(916) 355-7200/Office (916) 355-7227/Fax



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

**NAME & ADDRESS OF PROJECT:**

**DATE OF ISSUANCE:**

**RFI NUMBER:**

**CONTRACT FOR:**

**NAME & ADDRESS OF CONTRACTOR:**

**ENGINEER:**

File Reference  
OWNER ☐  
ENGINEER ☐  
CONTRACTOR ☐  
FIELD ☐  
OTHER ☐

---

DESCRIPTION OF PROBLEM / CLARIFICATION / INFORMATION REQUIRED:

Reference:

Subject:

Description:

PROPOSED SOLUTION:

Submitted by: \_\_\_\_\_  
Name Company / Position

---

RESPONSE:

---

This document is to provide additional information or clarification only, and does not constitute authorization or direction to proceed with any changed or additional work. Changed or additional work must be separately authorized in writing by the City.

Response by: \_\_\_\_\_  
Signature of A/E or other respondent Date

Reviewed by: \_\_\_\_\_  
Signature of A/E or other respondent Date

Cc: ☐ Contractor  
☐ IOR  
☐ CM  
☐ Other:  
☐ Other

# REQUEST FOR PROPOSAL

## *City of Folsom*

50 Natoma Street, Folsom, CA 95630  
(916) 355-8309/office (916) 355-7227/Fax



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

**NAME & ADDRESS OF PROJECT:**

**PROPOSAL REQUEST NUMBER: #1**

**DATE OF ISSUANCE:**

**NAME & ADDRESS OF CONTRACTOR:**

**OWNER:** City of Folsom

File Reference

OWNER ☐

CONTRACTOR ☐

FIELD ☐

OTHER ☐

---

Please submit an itemized proposal for changes in Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. Submit proposal within **2** days.

**THIS IS NOT** A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

---

Insert a written description of the proposed modification:

Attachments:

*(List attached documents that support description)*

---

REQUESTED BY:

---

*(Signature)*

---

*(Printed name and title)*

# PROPOSED CHANGE ORDER

City of Folsom - Environmental and Water Resources  
50 Natoma Street, Folsom, CA 95630  
O: 916-461-6162. Fax: 916-351-8912



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

**NAME & ADDRESS OF PROJECT:**

**P.C.O. NUMBER:**

**CONTRACT FOR:**

**NAME & ADDRESS OF CONTRACTOR:**

**ENGINEER:**

File Reference  
OWNER ☐  
ENGINEER ☐  
CONTRACTOR ☐  
FIELD ☐  
OTHER ☐

Contractor proposes to change the Contract as follows:

(If used in response to a Request For Proposal, identify Request for Proposal # \_\_\_\_\_)

## PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum is:

- ☐ Lump Sum (increase) (decrease) of \$ \_\_\_\_\_  
☐ Unit Price of \$ \_\_\_\_\_ per \_\_\_\_\_  
☐ Time & Materials, Not to Exceed \$ \_\_\_\_\_

2. The Contract Time is proposed to: ☐ Be adjusted ☐ Remain unchanged.

The proposed adjustment, if any: ☐ An increase of \_\_\_\_\_ days ☐ A decrease of \_\_\_\_\_ days

Signature by the Contractor indicates the Contractor's agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this Proposed Change Order as full and complete satisfaction of any direct or indirect additional cost incurred by Contractor in connection with performance of the proposed change work.

**ACCEPTED**

DATE:

**CONTRACTOR** (Typed Name)

(Signature)

(Print Name)

**APPROVED**

Date:

**Construction Manager** (Typed Name)

(Signature)

(Print Name)

**ACCEPTED**

Date:

**City of Folsom**

**OWNER** (Typed Name)

(Signature)

(Print Name)

# CONSTRUCTION CHANGE DIRECTIVE

## City of Folsom

Environmental and Water Resources Dept.  
50 Natoma Street, Folsom, CA 95639  
(916) 355-7200/Office (916) 355-7227/Fax



CITY OF  
**FOLSOM**  
DISTINCTIVE BY NATURE

NAME & ADDRESS OF PROJECT:

DATE OF ISSUANCE:

DIRECTIVE NUMBER:

File Reference

OWNER ☐

ENGINEER ☐

CONTRACTOR ☐

FIELD ☐

OTHER ☐

NAME & ADDRESS OF CONTRACTOR:

Documentation supporting proper completion of work by this C.C.D. must be attached to pay application.

### PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum:

☐ Lump Sum (increase) (decrease) of \$ \_\_\_\_\_

☐ Unit Price of \$ \_\_\_\_\_ per \_\_\_\_\_

☐ Time & Materials, Not to Exceed \$ \_\_\_\_\_

2. The Contract Time is proposed to: ☐ Be adjusted ☐ Remain unchanged.

3. The proposed adjustment, if any: ☐ An increase of \_\_\_\_\_ days ☐ A decrease of \_\_\_\_\_ days

### FIELD AUTHORIZATION

Owner's representative: \_\_\_\_\_  
(Authorized Signature) (Print Name) (Date)

Notes: \_\_\_\_\_  
\_\_\_\_\_

Signature by the Contractor indicates the Contractor's agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this Change Directive as full and complete satisfaction of any direct or indirect additional costs incurred by Contractor in connection with performance of the change work.

**ACCEPTED**

DATE :

CONTRACTOR (Company Name)

(Authorized Signature)

(Print Name)

When signed by the Owner and Architect and received by Contractor, this document becomes effective IMMEDIATELY, and the Contractor shall proceed with the change(s) described above.

**APPROVED**

DATE:

Construction Manager (Company Name)

(Authorized Signature)

(Print Name)

**ACCEPTED**

DATE:

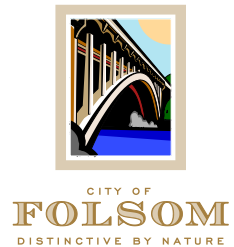
City of Folsom

OWNER

(Authorized Signature)

(Print Name)

City of Folsom  
ENVIRONMENTAL & WATER RESOURCES DEPARTMENT  
50 Natoma Street  
Folsom, CA 95630



# Change Order No. 1

**Contractor:**

**Project:**

**Date:**

**Project Manager:**

Upon mutual acceptance and execution of this document by the **City of Folsom**, hereinafter referred to as "City," and \_\_\_\_\_ hereinafter referred to as "Contractor," Contractor is hereby directed to make the following change or changes for the consideration set forth below:

## DESCRIPTION OF THE CHANGES:

ITEM #	DESCRIPTION	CREDIT/COST
1		
2		
	NET CHANGE ORDER ADJUSTMENT	\$0.00

<b>ORIGINAL CONTRACT AMOUNT</b>	
Net change by previous change orders	\$0.00
Contract sum prior to this change order	\$0.00
Contract adjustment by this change order	
<b>NEW CONTRACT AMOUNT (including all change orders)</b>	<b>\$0.00</b>

Acceptance of this Change Order constitutes an agreement between the City and Contractor, and the work is to be performed subject to the same terms and conditions as are contained in the original Contract with Contractor and for work on the above-mentioned project.

Acceptance of this Change Order constitutes acceptance of the Change Order as full and complete satisfaction of any direct or indirect additional costs incurred to you in connection with performance of the changed work.

END OF TEXT - SIGNATURE PAGE FOLLOWS

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed.

**CONTRACTOR:**

*(If a corporation, must be signed by two officers of the corporation per Corporations Code section 313.)*

\_\_\_\_\_  
Date

\_\_\_\_\_  
Tax I.D. Number

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

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

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

**CITY OF FOLSOM, A Municipal Corporation:**

\_\_\_\_\_  
Date

\_\_\_\_\_  
Elaine Andersen, City Manager

ATTEST:

FUNDING AVAILABLE:

\_\_\_\_\_  
Christa Freemantle, City Clerk                      Date

\_\_\_\_\_  
Stacey Tamagni, Finance Director                      Date

ORIGINAL APPROVED AS TO CONTENT:

ORIGINAL APPROVED AS TO FORM:

\_\_\_\_\_  
Marcus Yasutake,                      Date  
Environmental & Water Resources Director

\_\_\_\_\_  
Steven Wang, City Attorney                      Date

NOTICE: SIGNATURE(S) ON BEHALF OF CONSULTANT MUST BE NOTARIZED.

A certificate of acknowledgment in accordance with the provisions of California Civil Code section 1189 must be attached for each person executing this agreement on behalf of consultant. This section provides, at part (b): "Any certificate of acknowledgment taken in another place shall be sufficient in this state if it is taken in accordance with the laws of the place where the acknowledgment is made.



**SF-9**

**SUBMITTAL TRANSMITTAL**

Date:

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Attention: \_\_\_\_\_

The items listed below are subject to all the provisions of the plans, specifications, and addenda.

- ☐ Approved  
☐ Approved as Noted  
☐ Not Approved

- ☐ Resubmit  
☐ Submit additional copies  
☐

No. of Copies	I.D. No.	Manufacturer of Supplier	Subject Title

Enclosures:

Contractor (3)  
Project Engineer (1)  
Construction Inspector (1)  
Project File (1)

**PROPRIETARY INFORMATION AGREEMENT  
BETWEEN  
THE CITY OF FOLSOM  
AND**

**(Contractor)**

The City of Folsom (hereinafter referred to as City) wishes to receive from \_\_\_\_\_ (hereinafter referred to [Contractor] as Contractor) certain technical information claimed by the Contractor to be proprietary and hereinafter referred to as "Proprietary Data". Submittal of Proprietary Data by Contractor to City is required by the construction contract for testing, operating, and maintaining equipment, equipment assemblies and systems constructed under the contract. Contractor and City agree for a period of \_\_\_\_ years as follows:

1. The proprietary data is submitted to the City based on the understanding that the City would not disclose the same to others outside the City, nor reproduce the contents of said proprietary data or provide copies thereof to others outside the City without authorization from Contractor. Contractor claims proprietary rights in the contents of the proprietary data as a basis for preventing disclosure of the contents thereof to others. Contractor understands that the City has reservations as to the propriety of excluding the proprietary data from disclosure under the California Public Records Act (Government Code, Section 6250, et seq.).

2. The City may make such disclosure or reproduction of the proprietary data as is reasonably necessary or convenient to operate and maintain the subject equipment and to otherwise fully enjoy the use and benefit of the subject equipment.

3. Except as provided in paragraph 2, above, if any person makes a proper request to review or be provided with copies of the proprietary data or any part thereof, immediately upon notification thereof, Contractor agrees to defend the City and its officers, agents, and employees against any action resulting from denial of such request. If Contractor fails to promptly provide such defense, the City, its officers, agents, and employees shall be free to grant such requests.

4. Contractor shall indemnify and hold harmless the City, its officers, agents, and employees from any and all claims, costs, liabilities or damages, including attorney's fees and court costs resulting from the performance of this agreement.

EXECUTED on this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

CITY OF FOLSOM \_\_\_\_\_

(Contractor) \_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_

Title \_\_\_\_\_

**APPENDIX A**  
**SWPPP REQUIREMENTS LESS THAN 1 ACRE**

## **APPENDIX A - SWPPP REQUIREMENTS FOR LESS THAN AN ACRE**

### **WATER POLLUTION CONTROL**

The contractor's attention is directed to Section 6.08, "Water Pollution" of the General Provisions. This section supplements those specifications.

The contractor shall comply with the City of Folsom's stormwater quality requirements (Folsom Municipal Code (FMC) 8.70 (Stormwater Ordinance)), which prohibits the discharge of non-stormwater discharges, including sediment and construction-related pollutants, to the municipal storm drain system. These requirements apply in the wet season (October 1 – April 30) when stormwater runoff can carry sediment and pollutants to the storm drains, as well as during the dry season (May 1 – September 30), when non-stormwater discharges (e.g., sawcut and concrete slurry, polluted wash water) can impair water quality of local creeks and rivers.

The Contractor shall be responsible for the costs and for liabilities imposed by law as result of the Contractor's failure to comply with the provisions set forth in this section "Water Pollution Control". For the purposes of this paragraph, costs and liabilities include, but are not limited to, fines, penalties, and damages whether assessed against the City or the Contractor, including those levied under the Federal Clean Water Act and the State Porter Cologne Water Quality Act.

### **WATER POLLUTION CONTROL PLAN**

Unless provided by the City as part of the Contract Documents, within ten (10) calendar days of Notice to Proceed, the Contractor shall prepare and submit to the City for approval three (3) copies of a Water Pollution Control Plan. Construction work shall not commence until the Water Pollution Control Plan is approved, proper approvals and permits have been secured, and best management practices (BMPs) have been installed to protect the storm drainage system.

The City shall have five (5) calendar days to review the Water Pollution Control Plan. If revisions are required, as determined by the City, the Contractor shall revise and resubmit the Plan within five (5) calendar days of receipt of the City's comments. Upon the City's approval of the Plan, three (3) copies of the final Plan (incorporating the required changes) shall be submitted to the City. In order to allow construction activities to proceed, the City may conditionally approve the Water Pollution Control Plan while minor revisions are being completed.

The Contractor shall amend the Water Pollution Control Plan whenever there is a change in BMPs and/or operations which may affect the discharge of pollutants to the storm drainage system or when deemed necessary by the City when the Plan is not effectively achieving the water pollution control objectives. Amendments shall describe additional BMPs or revised operations and shall be submitted to the City for review and approval prior to implementation of revised practices.

At a minimum, the Plan shall provide or describe:

- Name, title, phone number(s) and e-mail address of person responsible for ensuring compliance with FMC 8.70 for the project. This individual shall ensure that appropriate BMPs are installed, inspected and maintained throughout the project, and removed and properly disposed of at the end of the job.

BMPs shall be inspected daily and repaired/replaced as needed. This person shall also monitor the weather and make arrangements for stormwater quality protection in the event of a predicted storm. This person shall coordinate with the City's representative on all stormwater issues and shall notify the City immediately of any incidents that discharge pollutants to the storm drain system and/or receiving waters.

- Drawing or map showing:
  - Limits of construction and locations of staging, storage and ingress/egress areas
  - Drainage patterns in the vicinity of the project
  - Location of on-site storm drain system and off-site storm drain inlets that could receive runoff from the project activities
  - Location of nearby creeks, wetlands or other receiving waters
- Expected pollutants to be generated or used during the project
- Describe the best management practices (BMPs) that will be employed for the duration of the project. At a minimum, the following BMPs shall be utilized:

<b>BMP</b>	<b>Description</b>	<b>Sacramento County Standard Detail # (if appl.) <i>see Attachment 1</i></b>	<b>CASQA BMP Reference<sup>1</sup></b>	<b>Caltrans BMP Reference<sup>2</sup></b>
Stabilize construction access	Provide stabilized construction access where construction traffic enters or leaves the construction site, to prevent sediment tracking onto public roads.	11-1	NA	TC-1
Protect storm drain inlets	Install sediment filters to protect all storm drain inlets having the potential to collect runoff from the construction area.	11-7	SE-10, DI protection type 3, except: only gravel/rock bags allowed (no sandbags)	SC-10 (except no sandbags allowed)
Keep pavement clean	Sweep and/or vacuum sidewalks and streets to remove sediment at the end of each work day and before predicted rain.	NA	SE-7	SC-7
Protect exposed soil surfaces – dry season (5/1 – 9/30)	Before predicted rain: cover exposed soil or use fiber rolls/wattles at edge of pavement to keep sediment from running into gutter.	11-4	EC-7, SE-5	SC-5
Protect exposed soil surfaces – wet season (10/1-4/30)	At the end of each workday and before predicted rain during the day: cover exposed soil or use wattles to keep sediment from running into gutter.	NA	EC-7, SE-5	SS-3, 4, 5, 6, & 7
Vacuum sawcut slurry	Use a vacuum to keep sawcut slurry out of gutters and storm drains.	NA	NS-3, WM-10	NS-3, WM-10

<sup>1</sup> Refer to California Stormwater Quality Association's (CASQA) Stormwater BMP Handbook for Construction Activities, 2009 or most recent edition [[www.cabmphandbooks.com](http://www.cabmphandbooks.com)] for BMP descriptions and details.

<sup>2</sup> Refer to Caltrans Construction Site BMPs [[www.dot.ca.gov/hq/oppd/stormwtr](http://www.dot.ca.gov/hq/oppd/stormwtr)]

<b>BMP</b>	<b>Description</b>	<b>Sacramento County Standard Detail # (if appl.) <i>see Attachment 1</i></b>	<b>CASQA BMP Reference<sup>1</sup></b>	<b>Caltrans BMP Reference<sup>2</sup></b>
Protect stockpiles	Protect stockpile materials from eroding into the gutter and storm drains at the end of each work day and before predicted rain.	NA	WM-3	WM-3
Prevent and control spills	Implement procedures to prevent and control spills.	NA	WM-4	WM-4
Manage trash and debris properly	Remove trash and debris from construction areas at the end of each work day.	NA	WM-5	WM-5
Manage concrete and paint wastes properly	Install and provide signage for designated concrete and paint washout areas. Place washouts at least 50' away from nearest drain inlet. Consider hiring concrete company with recycling units on concrete trucks so that designated washouts are not needed.	NA	WM-8	WM-8
Prevent portable toilet spills	Place portable toilet at least 50' away from nearest drain inlet and out of the gutter.	NA	WM-9	WM-9
Educate workers	Educate all contractor's and subcontractor's employees about stormwater pollution prevention	NA	NA	NA

*NA: Not available or applicable.*

The final selection of BMPs for this project shall be approved by the City's representative at the preconstruction meeting and/or during a pre-site inspection. It is the contractor's responsibility to call the City before commencing construction to set up a pre-site stormwater inspection with the City's Stormwater Inspector.

## **INSPECTION AND MAINTENANCE OF BMPS**

Upon approval of the Water Pollution Control Plan, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, and maintaining the BMPs included in the Water Pollution Control Plan and any amendments thereto and for removing and properly disposing of temporary BMPs as replaced and upon project completion. If the Contractor or the City identifies a deficiency in the deployment or functioning of a BMP, the deficiency shall be corrected immediately. The correction of deficiencies shall be at no additional cost to the City.

The Contractor may be required to remove certain temporary BMPs (e.g., storm drain inlet covers, containment berms) at the end of each work day and before predicted storm events, to prevent flooding.

## **REPORTING PROCEDURES**

The Contractor shall notify the City's representative immediately in the event of any discharge to

the storm drainage system or receiving waters, or spills of chemicals and other hazardous materials. If hazardous materials are involved, the Contractor shall first notify the Fire Department. The City will notify the appropriate regulatory authorities. The Contractor shall stop and contain the discharge upon discovery and conduct cleanup activities after consultation with the City.

## **INSPECTIONS BY REGULATORY AGENCIES**

At reasonable times and upon presentation of credentials and other documents as may be required by law, the Contractor shall allow authorized agents of the California Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency and the local storm water management agency to:

- A. Enter upon the construction site and the Contractor's facilities pertinent to the work;
- B. Have access to and copy water pollution control records;
- C. Inspect the construction site and related water pollution control practices; and
- D. Sample or monitor for the purpose of ensuring compliance with applicable laws and permits.

The Contractor shall notify the City's representative immediately upon request from any regulatory agency to enter, inspect, sample, monitor or otherwise access the project site or the Contractor's records.

## **PAYMENT**

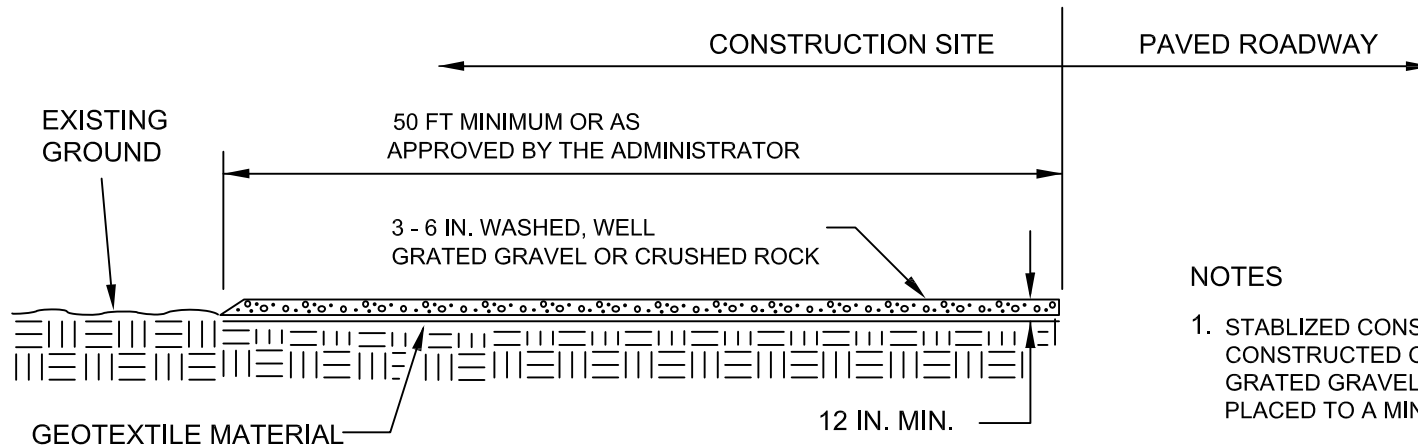
The City will pay not more than two percent (2%) of the total Contract Sum as a separate pay item for storm water pollution prevention plan. In the event the Contractor submits a storm water pollution prevention plan pay item greater than two percent (2%) of the total Contract Sum, the City will pay any excess storm water pollution prevention plan amount with the final Progress Payment. Refer to General Provisions Section 6.08 for additional information.

## **ATTACHMENT 1**

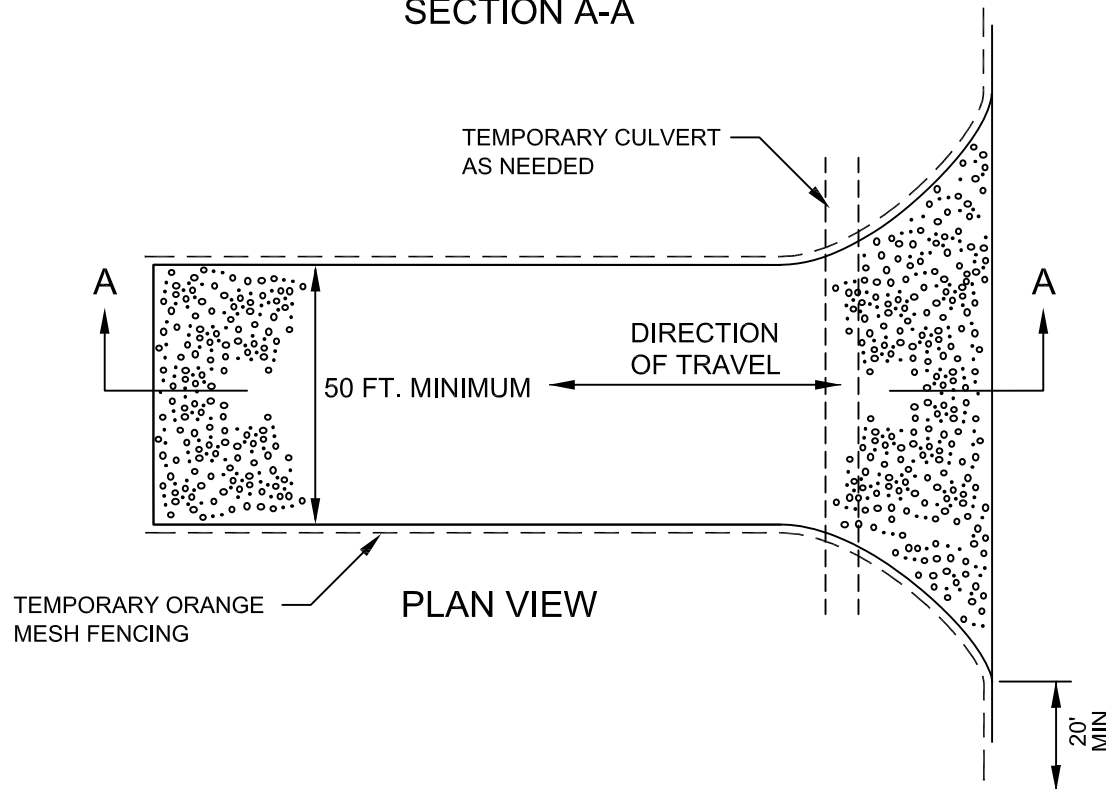
### **Sacramento County Standard Details Erosion and Sediment Control Measures**

11-1 Stabilized Entrance  
11-4 Staked Fiber Roll  
11-5 Silt Fence  
11-7 Inlet Sediment Barrier





### SECTION A-A



### NOTES

1. STABILIZED CONSTRUCTION SITE ACCESS SHALL BE CONSTRUCTED OF 3-6 INCH WASHED, WELL GRATED GRAVEL OR CRUSHED ROCK. MATERIAL SHALL BE PLACED TO A MINIMUM THICKNESS OF 12 INCHES.
2. LENGTH OF ENTRANCE SHALL BE A MINIMUM OF 50 FT. WIDTH SHALL BE A MINIMUM OF 10 FT. OR GREATER IF NECESSARY TO COVER ALL VEHICULAR INGRESS AND EGRESS. PROVIDE AMPLE TURNING RADII.
3. THE ENTRANCE SHALL BE KEPT IN GOOD CONDITION BY OCCASIONAL TOP DRESSING WITH MATERIAL AS SPECIFIED IN NOTE 1.
4. ACCESSES SHALL BE INSPECTED DAILY DURING PERIODS OF HEAVY USAGE, WEEKLY DURING NORMAL USAGE, AND AFTER EACH RAINFALL, WITH MAINTENANCE PROVIDED AS NECESSARY. PERIODIC TOP DRESSING SHALL BE DONE AS NEEDED.

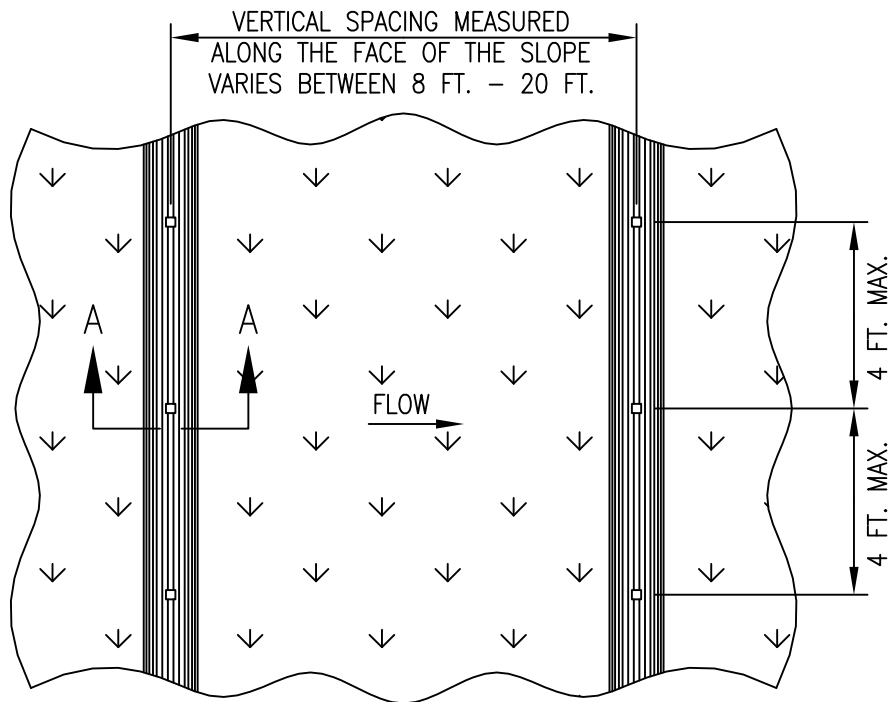
SACRAMENTO COUNTY  
MUNICIPAL SERVICES AGENCY

## STABILIZED CONSTRUCTION SITE ACCESS

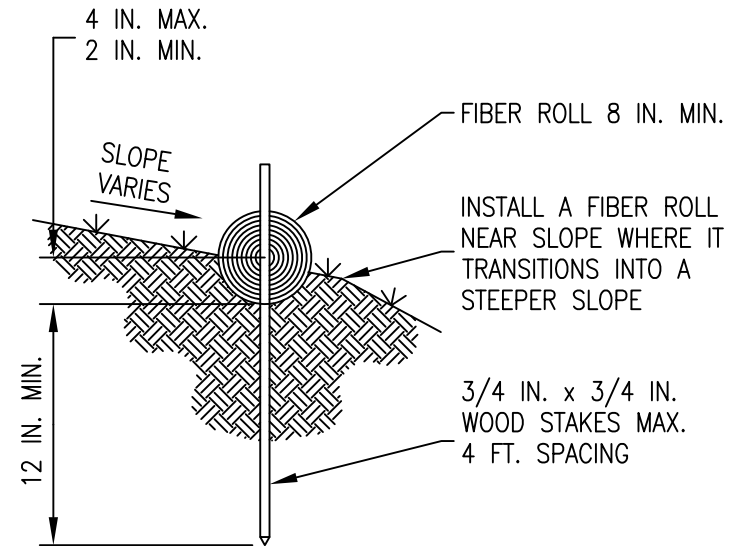
SCALE: NONE  
DATE : REV. Nov.2015  
DRAWN BY: AW

11-1

THIS DRAWING SUPERCEDES ALL PREVIOUS VERSIONS



TYPICAL FIBER ROLL INSTALLATION



SECTION A - A

NOTES:

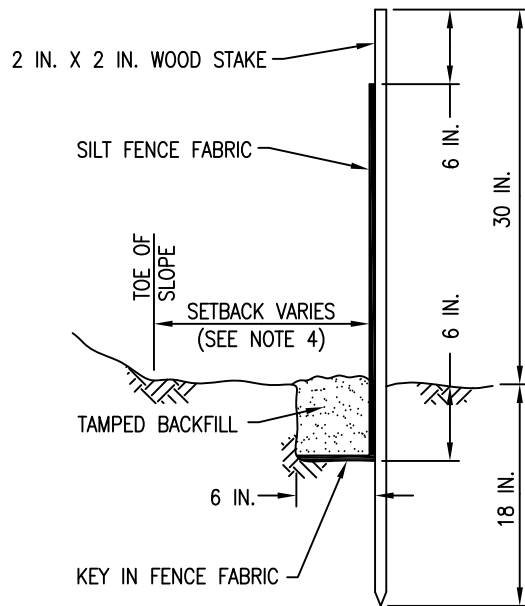
- 1.) INSTALL FIBER ROLLS IN A ROW ALONG A LEVEL CONTOUR.
- 2.) AT ENDS OF A ROW TURN THE LAST TWO FEET UP SLOPE SLIGHTLY.
- 3.) FIBER ROLLS SHALL BE OVERLAPED TIGHTLY AT THE JOINTS, NOT ABUTTED.

SACRAMENTO COUNTY  
MUNICIPAL SERVICES AGENCY

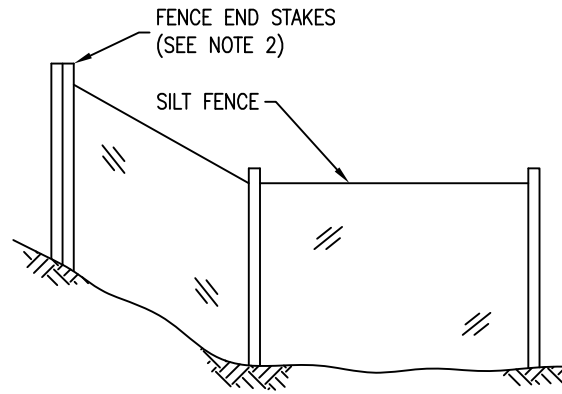
**FIBER ROLLS**

DRAWN BY: AW  
SCALE: NONE  
DATE: REV. Nov. 2015

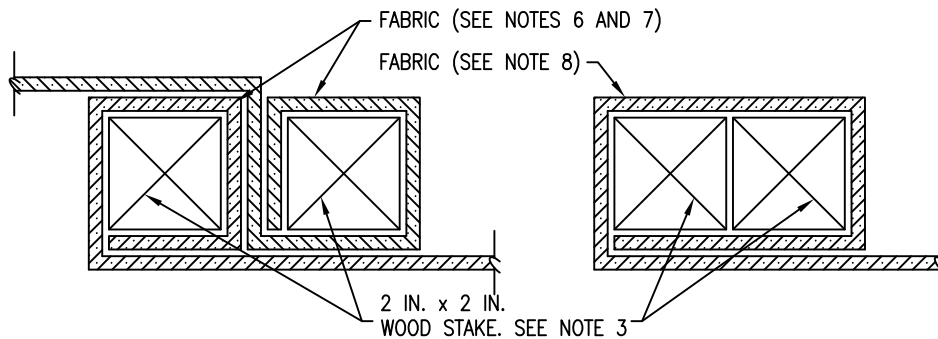
**11-4**



FENCE SECTION DETAIL

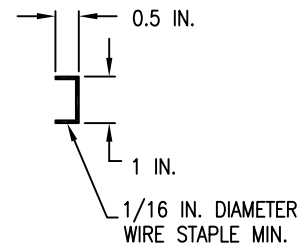


FENCE END DETAIL



JOINT DETAIL

END STAKE DETAIL



STAPLE DETAIL

NOTES:

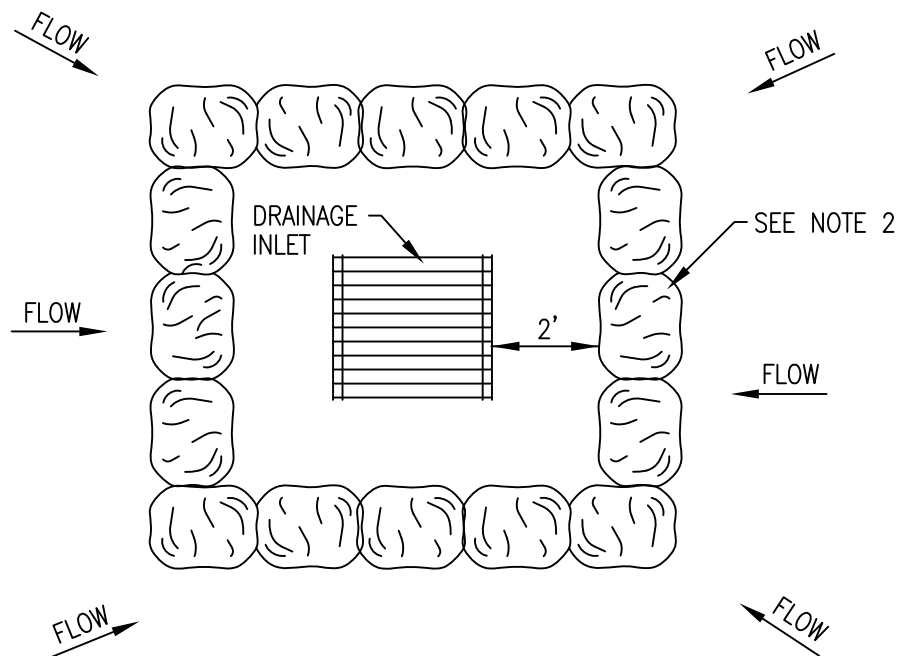
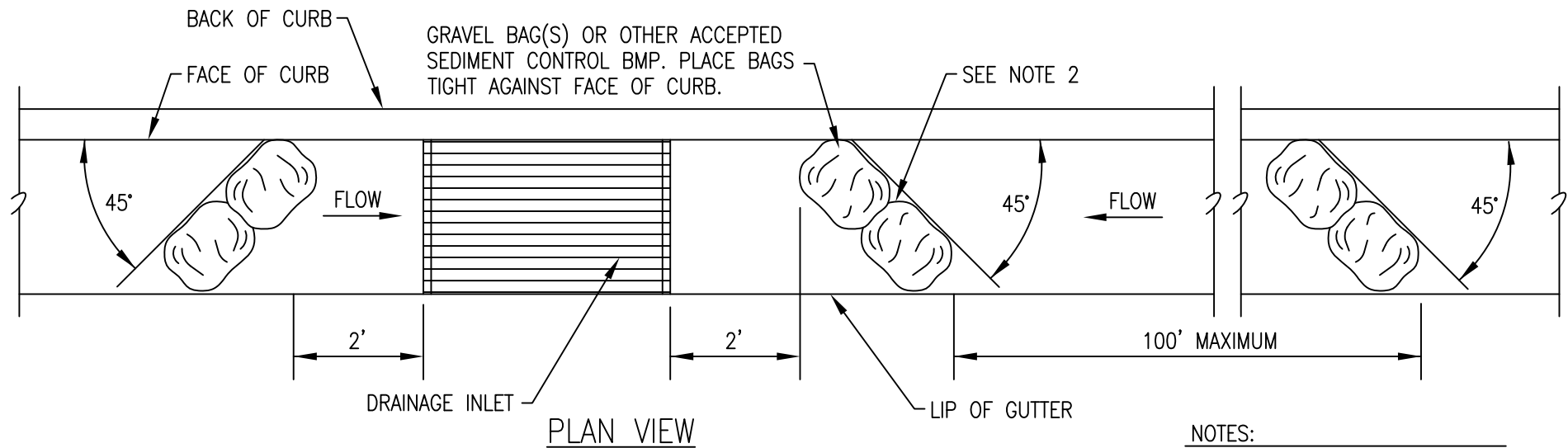
- 1.) CONSTRUCT THE LENGTH OF EACH REACH SO THAT THE CHANGE IN BASE ELEVATION ALONG THE REACH DOES NOT EXCEED  $\frac{1}{3}$  THE HEIGHT OF THE LINEAR BARRIER. IN NO CASE SHALL THE REACH LENGTH EXCEED 150M.
- 2.) THE LAST 8 FT. OF FENCE SHALL BE TURNED UP SLOPE.
- 3.) STAKE DIMENSIONS ARE NOMINAL.
- 4.) DIMENSIONS MAY VARY TO FIT FIELD CONDITION.
- 5.) STAKES SHALL BE SPACED AT 8 FT. MAXIMUM AND SHALL BE POSITIONED ON THE DOWNSTREAM SIDE OF THE FENCE.
- 6.) OVERLAP STAKES, AND FOLD FENCE FABRIC TO AROUND EACH STAKE ONE FULL TURN.
- 7.) STAKES SHALL BE DRIVEN TIGHTLY TOGETHER TO PREVENT POTENTIAL FLOW THROUGH OF SEDIMENT AT THE JOINT.
- 8.) FOR END STAKE CONDITION FOLD FENCE FABRIC AROUND (2) STAKES (1) FULL TURN AND SECURE WITH (4) STAPLES.
- 9.) MINIMUM (4) STAPLES PER STAKE.
- 10.) CROSS BARRIERS SHALL BE A MINIMUM OF  $\frac{1}{3}$  AND A MAXIMUM OF  $\frac{1}{2}$  THE HEIGHT OF THE LINEAR BARRIER.
- 11.) BOTTOM OF SILT FENCE SHALL BE KEYED-IN A MINIMUM OF 12".

SACRAMENTO COUNTY  
MUNICIPAL SERVICES AGENCY

**SILT FENCE**

DRAWN BY: AW  
SCALE: NONE  
DATE: REV. Nov. 2015

**11-5**



**NOTES:**

- 1.) SEDIMENT TRAPPED UPSTREAM OF SEDIMENT CONTROL BMP SHALL BE REMOVED WEEKLY AND PRIOR TO A RAINFALL EVENT.
- 2.) PLACE BMP'S TIGHTLY TOGETHER AT JOINTS TO PREVENT OR MINIMIZE SEEPAGE AT JOINTS.
- 3.) STORM DRAIN INLET FILTER BAGS ARE NOT ALLOWED UNLESS APPROVED BY THE MUNICIPAL SEPARATE STORM SEWER SYSTEM PERMIT ADMINISTRATOR.

**SACRAMENTO COUNTY  
MUNICIPAL SERVICES AGENCY**

**INLET SEDIMENT  
CONTROL**

DRAWN BY: AW  
SCALE: NONE  
DATE: REV. Nov. 2015

**11-7**