

**PROJECT MANUAL  
INCLUDING SPECIFICATIONS  
FOR**

**MCC REPLACEMENT**

TWAIN HARTE COMMUNITY SERVICES DISTRICT

AUGUST 2022



2022-08-12

KENNEDY/JENKS CONSULTANTS, INC.  
10850 Gold Center Dr  
Suite 350  
Rancho Cordova, CA 95670  
916-858-2700

JOB NO. 2270002\*00

## PROJECT MANUAL

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SECTION 00010  
INVITATION TO BID

1. Notice is hereby given that the Owner

<u>Twain Harte Community Services District</u>			
Owner			
<u>22912 Vantage Point Dr.</u>			
Address			
<u>Twain Harte</u>	<u>Tuolumne</u>	<u>California</u>	<u>95383</u>
City	County	State	

will receive sealed bids for performing the construction of

MCC Replacement  
Project Name

according to the Drawings and Project Manual including Specifications prepared by Kennedy/Jenks Consultants, Inc. accepted by the Owner and described in general as:

Replacement of a 600 amp, 240 volt, 3-phase motor control center (MCC), at the Twain Harte Community Services District's water treatment facility, as well as reconnection of existing load equipment to the new unit and provision of temporary power during construction to ensure continuity of service for critical load equipment at the facility.

2. Questions regarding the type of work required may be addressed to Tom Trott, General Manager, at phone number 209-586-3172 or [ttrott@twainhartecsd.com](mailto:ttrott@twainhartecsd.com).
3. Prospective bidders are encouraged to visit the project site before submitting a Bid to become better acquainted with the Work of this Contract. Visits must be scheduled and coordinated with the Owner at least 48 hours in advance. Contact Lewis Giambruno, Operations Manager (209-586-4988 / [lgiambruno@twainhartecsd.com](mailto:lgiambruno@twainhartecsd.com)).
4. Sealed bids will be received at the District's receptionist area at:

22912 Vantage Point Dr., Twain Harte CA 95383  
Place

until:

Friday, September 02, 2022, at 2:00 PM local time.

Bids may also be mailed to P.O. Box 649, Twain Harte CA 95683 so long as they are received prior to the above time. Bids received after that time will not be accepted. Bids will be opened in public and read aloud shortly after the specified closing time. Interested parties are invited to attend.

5. Bid security made payable to the Owner is required to accompany each bid. Bid security shall be in the form of a cashier's or certified check or a Bid Bond as required by the Bid Security Document following the Bid Form.
6. Requirements for California Public Works Contracts.

#### 6.1 Wage Rates

The State Director of the Department of Industrial Relations has established the general prevailing rates of per diem wages and rates for overtime and legal holidays in the locality in which the work is to be performed. Not less than said prevailing wages shall be paid for work on this project.

No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a).

No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

#### 6.2 License Requirements

The Contractor shall possess a valid State of California Class A General Engineering or Class C-10 Electrical Specialty Contractor's License at the time of submitting a bid OR at the time of contract award. The Contractor shall provide its license number classification and expiration date on the Bid Form.

#### 6.3 Security in Lieu of Retainage

Provisions concerning the Contractors' rights to deposit security in lieu of retainage in accordance with California Public Contract Code Sections 10263 and 22300 are covered in the Agreement.

7. No bidder may withdraw its Bid for a period of sixty (60) days after the time fixed for the opening of the bids, within which time an award will be made.

The Owner reserves the right to reject any and all bids or to waive any irregularities or informalities in any bid or in the bidding.

8. The Drawings and Project Manual including Specifications may be examined at the office of Twain Harte Community Services District at 22912 Vantage Point Dr., Twain Harte CA 95383 from 8:00 a.m. to 4:00 p.m., Monday through Friday.

9. The Drawings and Project Manual including Specifications may be obtained without charge at the District website at [www.twainhartecsd.com](http://www.twainhartecsd.com).

10. Time Constraints:

- 1 Requests for information received less than 10 days prior to Bid opening may not be answered.
- 2 Addenda will be issued no later than 7 days prior to Bid opening.
- 3 Bids shall remain in effect and subject to acceptance for 60 days after the date of Bid opening. If a contract is awarded, it will be awarded within the period that Bids are subject to acceptance.
- 4 The successful Bidder shall sign the required number of counterparts of the Agreement and deliver them together with the required bonds to the Owner within 15 days after the date of the Notice of Award.
- 5 The Owner will sign the Agreement and deliver a fully-signed counterpart to the Contractor within 10 days after receipt of the required signed counterparts of the Agreement and Satisfactory Bonds from the Contractor.
- 6 The Owner may issue the Notice to Proceed at any time between the time the Agreement is fully signed by all parties and 90 days thereafter.
- 7 The Contract time shall begin to run on the date stated in the Notice to Proceed and the Contractor shall begin construction at the site within 10 days thereafter but not before submitting required insurance certificates.
- 8 The Work shall be fully completed within the Contract Time which is 228 days as stated in the Agreement.
- 9 Progress payments shall be made monthly and shall cover work performed up to the Application for Payment Date which shall be the last day of each month. The Contractor shall submit its Application for Payment at least 5 days prior to the Application for Payment Date. The Owner shall make payment within 25 days after the Engineer issues a Recommendation for Payment.

END OF INVITATION TO BID

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SECTION 00100  
INSTRUCTIONS TO BIDDERS

**Article 1. General**

Bidding Documents containing the Bidding Requirements are provided to prospective Bidders to enable them to prepare a Bid. Documents that must be submitted with the Bid are listed at the end of the Instructions to Bidders.

**Article 2. Defined Terms**

2.1 Terms used in these Instructions to Bidders which are defined in the GENERAL CONDITIONS of the Construction Contract have the meanings assigned to them in the General Conditions.

2.2 The term "Addenda" (Addendum) means the written or graphic instruments issued prior to execution of the Agreement which modifies or interprets the Bidding Documents and Contract Documents.

2.3 The term "Bidder" means any person, firm or corporation submitting a Bid directly to Owner, as distinct from a sub-bidder, who submits a Bid to a Bidder.

2.4 The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

2.5 The term "Bid" means the offer or proposal of the Bidder submitted on the prescribed forms setting forth the prices for the work to be performed and furnishing other required information.

2.6 The term "Base Bid" means the amount bid on all of the work required to complete a single Contract as described in the Contract Documents. The Base Bid submitted by the successful Bidder combined with any additive or deductive amounts bid on alternates accepted by the Owner and any other modifications becomes the Contract Price.

2.7 The term "Bidding Documents" includes the Invitation to Bid, Instructions to Bidders, Information Available to Bidders, the Bid Form with related documents, the Contract Conditions, Specifications and Drawings (and includes all Addenda issued prior to receipt of Bids.)

2.8 The terms "Contract" and "Project" are defined in the General Conditions paragraph 1.1.

2.9 The term "Notice of Award" is a written notice by the Owner to the Bidder that it is the successful Bidder and upon the Bidders compliance with the Owner's requirements the Owner will execute the Agreement.



### **Article 3. Copies of Bidding Documents**

3.1 Complete sets of Bidding Documents (the Drawings and Project Manual including Specifications) may be obtained at the location and time designated in the Invitation to Bid.

3.2 Complete sets of Bidding Documents must be used in preparing Bids; neither the Owner nor the Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.3 The Owner and the Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not confer or grant a license for any other use.

### **Article 4. Examination of Contract Documents and Site**

4.1 It is the responsibility of each Bidder before submitting a Bid to (a) examine the Bidding Documents thoroughly; (b) visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work; (c) dig test pits or drill test holes to further evaluate subsurface soil conditions to the extent the Bidder considers necessary; (d) consider federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work; (e) study and carefully correlate Bidder's observations with the Contract Documents; and (f) notify the Engineer of all conflicts, errors or discrepancies in the Contract Documents.

4.2 Differing Conditions:

.1 General Conditions paragraphs 3.3 through 3.5 limit the extent to which the Contractor may rely on information provided by the Owner or the Design Engineer with regard to: a) subsurface soil conditions, b) existing concealed or underground utilities and underground facilities, and c) existing structures and facilities.

.2 General Conditions paragraphs 3.6 and 3.8 identify the Contractor's responsibility: a) for using care in making excavations and in doing demolition, b) for damage to existing utilities and underground facilities and for loss of use thereof, and c) for the protection of workers and others from known and unknown or concealed hazards.

.3 General Conditions paragraph 3.7 identifies conditions under which the Contractor may be entitled to a change in Contract Time or Price due to differing or unknown conditions.

4.3 The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor. Easements for permanent facilities or utilities or easements for permanent changes in existing facilities or utilities have been obtained or will be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

4.4 Bidder's Representations. By submitting a Bid each Bidder represents and warrants:

.1 It has visited the site and has reviewed the Bidding Documents and the Information Available to Bidders; it has made any other investigations, explorations or tests and has obtained any other data it considers necessary for preparation of its Bid; and it has read and understands provisions in the General Conditions relevant to differing and unknown conditions.

.2 It has read, studied and understands the entire set of Bidding Documents including the Construction Drawings, Specifications and General Conditions and finds them fit and sufficient for the purpose of preparing its Bid and constructing the Work required.

.3 Its Bid is based on providing all of the material, labor, equipment and services necessary to complete the Work in full compliance with the Contract Documents without exception.

#### **Article 5. Interpretations and Addenda (Before Contract Award)**

5.1 All questions about the meaning or intent of the Contract Documents are to be directed to the Engineer. Interpretations or responses considered necessary by the Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the Engineer as having received the Bidding Documents. Questions received less than ten (10) days prior to the date for opening of bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or responses will be without legal effect and are not to be relied upon by the Bidders unless they are integrated into the written Contract Documents.

5.2 Addenda may also be issued to modify the Bidding Documents as deemed advisable by the Engineer.

#### **Article 6. Bid Security**

Each Bid must be accompanied by Bid Security conforming to the requirements of 00410, Bid Security.

#### **Article 7. Contract Time**

The numbers of days (Contract Time) within which the Work is to be Substantially Completed and Finally Completed and ready for acceptance and final payment are set forth in the Bid Form and the Agreement.

#### **Article 8. Liquidated Damages**

Provisions for liquidated damages, if any, are set forth in the Agreement.

#### **Article 9. Substitute or Proposed Equivalent ("Or Equal") Items**

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or Proposed Equivalent ("Or Equal") items. Whenever it is indicated in the Drawings or specified in the Specifications that a Proposed Equivalent ("Or Equal") item of material or equipment may be furnished or used by the Contractor if acceptable to the Engineer, such acceptance will not be considered by the Engineer until after the Effective Date of the Agreement. The procedure for submission of any such Proposed Equivalent ("Or Equal") item by the Contractor for the Engineer's review and consideration is set forth in Article 8 of the GENERAL CONDITIONS under Specified Items/Proposed Equivalents and may be supplemented in Division One.

## **Article 10. Listing of Subcontractors**

The Contractor's Bid must include a listing of subcontractors conforming to the requirements and format of 00430.

## **Article 11. Bid Form**

11.1 The Bid Form is included with the Bidding Documents; additional copies may be reproduced by the Bidder.

11.2 All blanks on the Bid Form must be completed legibly in ink or by typewriter. Bid amounts must be stated in words and in figures.

11.3 Bids by corporations must be executed in the corporate name by the president or a vice president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.

11.4 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

11.5 All names must be legibly printed in ink or typed below the signature.

11.6 The Bid shall contain an acknowledgement of receipt of all ADDENDA (the numbers of which must be filled in on the Bid Form).

11.7 The address and telephone number for communications regarding the Bid must be shown.

11.8 When the Bidding Documents include more than one Contract, Bidders may submit a Bid for any of the individual portions of the project defined in Bidding Documents as a separate Contract or any combination of Contracts provided for in the Bid Form.

11.9 Bids must include a single lump sum price for the Base Bid and a separate price or state "no change in price" for each Alternate described in the Specifications and listed on the Bid Form. The Bid for each Alternate will be the amount to be added to or deducted from the Base Bid if the Owner selects the Alternate. Bids that do not include a price for every Alternate may be rejected.

## **Article 12. Submission of Bids**

Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the Project title and, when the Project includes more than one Contract, with the designated Contract or portion of the project for which the Bid is submitted. The envelope shall bear the name and address of the Bidder and the Bid shall be accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

## **Article 13. Modification and Withdrawal of Bids**

13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

13.2 If, within five days after Bids are opened, any Bidder files a duly signed, written notice with the Owner and promptly thereafter demonstrates in detail to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, how the mistake occurred, that the mistake was not due to an error in judgment or to carelessness in inspecting the site or reading the plans or specifications, that Bidder may withdraw its Bid and the Bid Security will be returned. A Bidder who withdraws its Bid will be disqualified from further bidding on the Work to be provided under the Contract Documents. (See California Public Contract Code 5103)

## **Article 14. Opening of Bids**

Bids will be opened and (unless obviously non-responsive) read aloud publicly. An abstract of the amounts of the Base Bids and major Alternates (if any) will be made available to Bidders after the opening of Bids.

## **Article 15. Bids to Remain Subject to Acceptance**

All Bids will remain subject to acceptance for sixty (60) days after the day of the Bid opening, but the Owner may, in its sole discretion, release any Bid and return the Bid Security prior to that date. Bids on Alternates shall remain valid for 60 days after execution of the Agreement.

## **Article 16. Award of Contract**

16.1 The Owner reserves the right to reject any and all Bids and to waive any and all irregularities in Bids not involving price, time or changes in the Work. The Owner reserves the right to reject any nonconforming, nonresponsive, incomplete, unbalanced or conditional Bids. The Owner also reserves the right to reject the Bid of any Bidder that in the Owner's judgment would not be financially or otherwise responsible or that does not meet pertinent minimum experience criteria established by the Owner and stated in the Instructions to Bidders.

16.2 In evaluating Bids, the Owner will consider whether or not the Bids comply with the prescribed requirements, and include such Alternates, unit prices and other data, as may be required in the Bid Form and supplements thereto.

16.3 Discrepancies in the multiplication of units of Work and unit prices, if any, will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between bid amounts stated in words and in figures will be resolved in favor of the amount stated in words.

16.4 The Owner may accept any Alternate without regard to the order in which they are listed and will determine the lowest Bidder on the basis of the Base Bid and the Alternates accepted.

16.5 If the Contract is to be awarded, it will be awarded to the lowest qualified, responsible and responsive Bidder that in the Owner's judgment will be in the best interests of the Project.

16.6 If the Contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within the number of days that Bids are subject to acceptance as stated in Article 15.

### **Article 17. Contract Security**

17.1 The Owner's requirements for performance and payment bonds are set forth in Article 4 of the General Conditions.

17.2 The Successful Bidder shall engage a surety who through binding agreement will assume liability for all debts and responsibility for the acceptable performance of the Work under this Contract if the Contractor defaults.

17.3 When the Successful Bidder delivers the executed Agreement to the Owner, it must be accompanied by the required bonds in the forms contained in the section of the Project Manual titled Contract Forms.

### **Article 18. Insurance**

18.1 The Owner's requirements for insurance are set forth in Article 4 of the General Conditions.

18.2 The Successful Bidder shall purchase insurance from an insurance company or companies who meet the requirements of General Conditions paragraphs 4.3 through 4.5, will provide the required insurance and will furnish insurance certificates.

18.3 The Successful Bidder shall deliver the required insurance certificates to the Owner and Engineer prior to beginning work. In no case will the Notice to Proceed be considered as allowing the Work to begin until the insurance certificates are received by the Owner, even though the Contract Time as stated in the Notice to Proceed will commence to run.

18.4 If Acts of God insurance is required, it will be quoted as a separate bid item.

### **Article 19. Signing of Agreement**

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within fifteen days thereafter the Contractor shall sign and deliver the required number of counterparts of the Agreement together with the required Bonds to the Owner. Within ten days thereafter the Owner will deliver one fully signed counterpart to the Contractor. Each counterpart is to be accompanied by a complete set of the Drawings with appropriate identification which shall be signed by the parties to the Agreement.

### **Article 20. Retainage**

The percentage of retainage that will be withheld from each Progress Payment is set forth in the Agreement.

Provisions concerning the Contractor's rights to deposit securities in lieu of retainage in accordance with California Public Contract Code Sections 10263 and 22300 are set forth in the Agreement.

**Article 21: Not used**

**Article 22. Pre-Bid Conference**

No pre-bid conference will be held.

**Article 23. Pre-Bid Site Visit; Access to Site**

Bidders are encouraged to visit the site prior to submitting a bid. The Contractor may arrange with the Owner for access to the site with 48 hours advance notice. Contact Lewis Giambruno, Operations Manager (209-586-4988 / lgiambruno@twainhartecsd.com).

**Article 24. Not used**

**Article 25. Not used**

**Article 26. Minimum Experience Requirement**

Bidder shall submit 00420 Bidder's Qualifications, with its Bid to verify it has the minimum experience qualifications required for bidding.

In the Owner's judgment, the minimum experience requirement for Bidders to Bid on this Contract is the successful completion of at least two projects similar in size complexity and construction cost to the project being bid at this time.

**Article 27. Not used**

**Article 28. Documents that Must be Submitted with Bids**

Bidders must submit the following signed Documents with their Bids:

<u>Document Number</u>	<u>Title</u>
00300	Bid Form
00410	Bid Security
00414	Security for Compensation Certificate
00416	Bidder's References
00420	Bidder's Qualifications
00430	Subcontractor List
00480	Non-collusion Affidavit

END OF INSTRUCTIONS TO BIDDERS

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SECTION 00300

BID FORM

Project Identification: MCC Replacement  
(If applicable, also indicate Contract designation for the portion of Project for which Bid is submitted).

This Bid is Submitted To: Twain Harte Community Services District  
PO Box 646 Twain Harte CA 9538  
(Name and Address of Owner)

The Engineer is:  
Kennedy/Jenks Consultants, Inc.  
(Name)  
2882 Prospect Park Dr. Suite 240, Rancho Cordova CA 95670  
(Address)  
916-858-2700  
(Phone Number)

**Article 1**

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

**Article 2**

Bidder accepts all of the terms and conditions of the Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for sixty (60) days after the day of Bid opening. Bidder will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within fifteen (15) days after the date of the Owner's Notice of Award.

**Article 3**

In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that:

- (a) Bidder has examined copies of all the Bidding Documents.



- (b) Bidder has examined copies of the following Addenda (receipt of which is hereby acknowledged):

<u>Date</u>	<u>Number</u>
_____	_____
_____	_____
_____	_____

- (c) Bidder has familiarized itself with the nature and extent of the Contract Documents, Work, site locality, and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
- (d) Bidder has read and accepts the provisions in General Conditions paragraphs 3.3 through 3.5 which limit the extent to which the Contractor may rely on information provided by the Owner or the Design Engineer with regard to: a) subsurface soil conditions, b) existing concealed or underground utilities and underground facilities, and c) existing structures and facilities.
- (e) Bidder has read and accepts the provisions in General Conditions paragraphs 3.6 and 3.8 identifying the Contractor's responsibility: a) for using care in making excavations and in doing demolition, b) for damage to existing utilities and underground facilities and for loss of use thereof, and c) for the protection of workers and others from known and unknown or concealed hazards.
- (f) Bidder has read and accepts the provisions in General Conditions paragraph 3.7 which identifies the limited conditions under which the Contractor may be entitled to a change in Contract Time or Price due to differing or unknown conditions.
- (g) Bidder has visited the site and has reviewed the Bidding Documents and the Information Available to Bidders and it has made any other investigations, explorations or tests and has obtained any other data it considers necessary for preparation of its Bid.  
  
Bidder has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the Contract Documents and Bidder has read and understands provisions in the General Conditions relevant to differing and unknown conditions.
- (h) Bidder has given Engineer written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Bidder.
- (i) Bidder has read, studied and understands the entire set of Bidding Documents including the Construction Drawings, Specifications and General Conditions and finds them fit and sufficient for the purpose of preparing its Bid and constructing the Work required.
- (j) Bidder represents that its Bid is based on providing all of the material, labor, equipment and services necessary to complete the Work in full compliance with the Contract Documents without exception.

**Article 4**

**Requirements for California Public Works Contracts.**

- (a) **DECLARATION OF LICENSE STATUS.** The Bidder declares that it possesses a valid State of California Class A - General Engineering OR Class C -10 Electrical Contractor's license at the time of submitting this Bid.

Bidder shall state its license number, classification and expiration date on its Bid Form.

- (b) **PREVAILING WAGE RATES.** The undersigned agrees that, if awarded the Contract, the undersigned and all of its subcontractors shall pay all laborers, workers, and mechanics employed in the performance of such Contract, or any subcontract thereunder, not less than the general prevailing rate of per diem wages and rates for overtime and legal holidays in the locality in which the work is to be performed, as ascertained and determined, by the statutes and regulations applicable thereto.
- (c) **NONCOLLUSION AFFIDAVIT.** In accordance with Public Contract Code Section 7106, Bidders are required to execute and submit with their Bid Document Number 00480 "Noncollusion Affidavit."
- (d) **USE OF BID DEPOSITORIES.** The Bidder declares that it has not used subcontractors' bids from a bid depository that in any way attempts to restrict, control, influence or regulate free open price competition among subcontractors in the submission of their bids to prime Bidders.
- (e) **SECURITY FOR COMPENSATION CERTIFICATE.** Bidders are required to execute and submit with their Bid Document Number 00414 "Security for Compensation Certificate."

**Article 5**

Bidder will complete the Work for the following lump sum price(s):

BASE BID (Add)

\_\_\_\_\_ (\$ \_\_\_\_\_)  
 (use words) (figures)

*[Prices quoted include specified cash allowances]*

**Acts of God Insurance**

Add an endorsement to the Contractor's Property Insurance to provide full replacement cost coverage in the amount of the Contract Price plus modifications thereto for physical loss or damage due to "Acts of God" including earthquakes of a magnitude of Richter 3.5 and above and tidal waves.

Add: \_\_\_\_\_ (\$ \_\_\_\_\_)  
 (words) (figures)

## Article 6

- (a) Bidder agrees that the Work will be finally complete and ready for acceptance and final payment in accordance with Article 13 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- (b) Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work on time.

## Article 7

The following documents are attached to and made a condition of this Bid:

- (a) Required Bid Security in the form of \_\_\_\_\_
- (b) Security for Compensation Certificate
- (c) Bidder's References
- (d) Bidder's Qualifications
- (e) Subcontractor List
- (f) Noncollusion Affidavit

## Article 8

Communications concerning this Bid shall be addressed to:

Tom Trott, PE  
General Manager

At the following address:

PO Box 646  
Twain Harte CA 95383

Telephone Number:

209-586-3172

Email Address:

ttrott@twainhartecsd.com

## Article 9

The terms used in this Bid which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents have the meanings assigned to them in the General Conditions.

Bidder declares that it does possess a contractor's license of the required classification, valid in the appropriate jurisdiction at the time of submitting this bid.

Contractor's license number: \_\_\_\_\_

License classification: \_\_\_\_\_

License expiration date: \_\_\_\_\_

SUBMITTED on \_\_\_\_\_, 20\_\_\_\_.

If Bidder is:

An Individual

By: \_\_\_\_\_ (SEAL)  
Individual's Name

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

Doing business as: \_\_\_\_\_

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

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

A Partnership

By: \_\_\_\_\_ (SEAL)  
(Firm Name)

\_\_\_\_\_  
(General Partner Name)

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

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

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

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

A Corporation

By: \_\_\_\_\_  
(Corporation's Name)

\_\_\_\_\_  
(State of Incorporation)

By: \_\_\_\_\_  
(Name of Person Authorized to Sign)

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

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

Attest \_\_\_\_\_  
(Secretary)

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

\_\_\_\_\_

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

Home Office Address (if different from above): \_\_\_\_\_

\_\_\_\_\_

A Joint Venture

By: \_\_\_\_\_  
(Name)

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

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

\_\_\_\_\_

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

By: \_\_\_\_\_  
(Name)

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

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

\_\_\_\_\_

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

Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture shall be in the manner indicated above.

END OF BID FORM

## SECTION 00410

### BID SECURITY

1.1 Bid Security, made payable to the Twain Harte Community Services District, shall accompany each Bid. Bid Security shall be in the form of a cashier's check or certified check in the amount of not less than ten percent (10%) of the Bidder's maximum price, or in the form of a Bid Bond in said amount (in the form attached). Bid Bond shall be executed by such sureties as are named in the current list of "Certified Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds or Certified Reinsurer Companies Holding Certificates Of Authority As Acceptable Reinsuring Companies" published in Circular 570 (most recent amendment) by the Audit Staff Bureau of Accounts, U.S. Treasury Department ([www.fms.treas.gov/c570/index.html](http://www.fms.treas.gov/c570/index.html)) and is admitted to issue bonds in the states in which the Project is located and all Work is performed. All bonds signed by an agent shall be accompanied by a certified copy of the authority to act.

1.2 Bid Security shall remain subject to acceptance for sixty (60) days after the day of the Bid opening, but the Owner may, at its sole discretion, release any Bid and return the Bid Security prior to that date.

1.3 The Bid Security of the successful Bidder will be retained until such Bidder has within fifteen (15) days of issuance of written notice of contract award;

- (a) Executed the contract agreement,
- (b) Furnished a performance bond and a payment bond fully executed as described in the Contract Forms section.
- (c) Furnished certificates of insurance as described in the General Conditions, and

If the successful Bidder fails to deliver the executed documents described above within fifteen days after Notice of Award, the Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited.

1.4 The Bid Security of other Bidders whom the Owner believes to have a reasonable chance of receiving the award may be retained by the Owner until the earlier of the seventh day after the effective date of the Agreement or the sixty-first (61<sup>st</sup>) day after the Bid opening, whereupon Bid Security furnished by such Bidders will be returned.

1.5 Bid Security with Bids which are not competitive will be returned within seven days after the Bid.

BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned,

\_\_\_\_\_

as Principal, and

\_\_\_\_\_

as Surety, are hereby held and firmly bound unto

\_\_\_\_\_

as Owner in the penal sum of

\_\_\_\_\_

dollars for the payment of which sum, well and truly to be made, we hereby bind ourselves, our successors and assigns jointly and severally firmly by these presents.

Signed and sealed, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

The Condition of the above obligation is such that where the Principal has submitted a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for construction of

\_\_\_\_\_

Project.

NOW, THEREFORE;

- (a) If said Bid shall be rejected, or
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of the Agreement attachment hereto (properly completed in accordance with said Bid) and shall furnish Bonds for Faithful Performance of said contract, and for the Payment of all persons performing labor and furnishing material in connection therewith, and provide certificates and policies of insurance as specified in the Bid documents and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its Bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first set forth above.

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

\_\_\_\_\_

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

END OF BID BOND



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SECTION 00414

SECURITY FOR COMPENSATION CERTIFICATE  
(To be submitted with Bid)  
(Required by Section 1861, California Labor Code)

TO: \_\_\_\_\_  
(Owner)  
\_\_\_\_\_

I am aware of the provisions of Section 3700 of the Labor Code of the State of California which require every employer to be insured against liability for workers' compensation claims 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.

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

\_\_\_\_\_  
(Type or Print Name)

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

\_\_\_\_\_  
(Company)

\_\_\_\_\_  
(Business Address)

\_\_\_\_\_

\_\_\_\_\_  
(Place of Residence)

END OF SECURITY FOR COMPENSATION CERTIFICATE

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SECTION 00416

BIDDER'S REFERENCES  
(To be submitted with Bid)

Reference is hereby made to the following bank or banks about the financial responsibility of the Bidder:

<u>Name of Bank</u>	<u>Address</u>
_____	_____
_____	_____
_____	_____

Reference is hereby made to the following surety company or companies about the financial responsibility and general reliability of the Bidder:

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

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

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

END OF BIDDER'S REFERENCES

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SECTION 00420

BIDDER'S QUALIFICATIONS  
(To be submitted with Bid)

The Bidder has been engaged in the contracting business, under the present business name for \_\_\_\_\_ years. Experience in work of a nature similar to that covered in the proposal extends over a period of \_\_\_\_\_ years.

The Bidder, as a contractor, has never failed to satisfactorily complete a contract awarded to him, except as follows:

\_\_\_\_\_

The following contracts have been satisfactorily completed in the last three years for the persons, firm or authority indicated, and to whom reference is made:

<u>Year</u>	<u>Type of Work</u>	<u>Contract Amount</u>	<u>For Whom</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Signed \_\_\_\_\_  
(Same signature as on bid form)

END OF BIDDER'S QUALIFICATIONS

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SECTION 00430

SUBCONTRACTOR LIST  
(To be submitted with Bid)

Each Bidder shall set forth below with its bid:

(a) The name and the location of the place of business of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the Contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of 1 (0.5%) percent of the Contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 (0.5) percent of the Contractor's total bid or ten thousand dollars (\$10,000), whichever is greater.

(b) The portion of the work which will be done by each such Subcontractor. The Contractor shall list only one Subcontractor for each portion of the work.

If the Bidder fails to specify a Subcontractor for any portion of the work as above-stated, or if the Bidder lists more than one Subcontractor for the same portion of the work, he agrees to perform that work himself. The following is submitted concerning Subcontractors:

<u>Name:</u> <u>Subcontractor</u>	<u>Address</u> <u>Shop, Mill or Office</u>	<u>Class</u> <u>of</u> <u>Work</u>	<u>Portion of</u> <u>Work to be</u> <u>Done</u>	<u>Subcontractor's</u> <u>License Number</u> <u>and Class</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____





SECTION 00480

NONCOLLUSION AFFIDAVIT  
(To be submitted with Bid)

In accordance with Section 7106 of the State of California Public Contract Code, Bidders are required to execute the following Noncollusion Affidavit.

NONCOLLUSION DECLARATION TO BE SUBMITTED WITH BID

I, \_\_\_\_\_, declare that I am \_\_\_\_\_  
(Name) (Title)  
of \_\_\_\_\_, the party making the foregoing bid, that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder or 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 or 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.

Executed on \_\_\_\_\_, 20\_\_\_\_, in \_\_\_\_\_.

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

\_\_\_\_\_  
(Signature of Declarant)

END OF NONCOLLUSION AFFIDAVIT

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SECTION 00500

AGREEMENT

THIS AGREEMENT made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, by and between Twain Harte Community Services District, Tuolumne County, State of California, herein called the Owner, and \_\_\_\_\_, herein called the Contractor.

IT IS AGREED:

**Article 1. WORK**

In consideration of the agreements herein made by the Owner and the sums of money to be paid to the Contractor by the Owner in the manner and form as provided in the attached Contract Documents, the Contractor agrees to furnish all labor, tools, appliances, equipment, plant and transportation, and any and all other expenses necessary or incidental to the performance of the Work as specified or shown in the Contract Documents including such alternates and additional bid items as are listed in Article 3. The Work is generally described as follows:

The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows

Replacement of a 600 amp, 240 volt, 3-phase motor control center (MCC), at the Twain Harte Community Services District's water treatment facility, as well as reconnection of existing load equipment to the new unit and provision of temporary power during construction to ensure continuity of service for critical load equipment at the facility.

The Contract Documents which define the Work covered by this Agreement are those prepared by the Design Engineer Kennedy/Jenks Consultants, Inc. and filed in the office of the Twain Harte Community Services District and identified by the signatures of the parties to this Agreement.

The Work was designed by and the Contract Documents were prepared by Kennedy/Jenks Consultants, Inc. herein referred to as the Design Engineer.

The Owner's representative during the construction phase will be Tom Trott, General Manager, herein referred to as the Engineer who will assume the duties and responsibilities and will have the rights and authority assigned to the Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

**Article 2. CONTRACT TIME AND LIQUIDATED DAMAGES**

(a) Time of Performance: In accordance with the Specifications the Contractor further agrees to plan the Work and to prosecute it with diligence and shall commence the Work within ten (10) days after the date established in Notice to Proceed from the Owner, and shall Finally Complete the Work within two-hundred twenty-eight (228) calendar days from date of commencement in the Notice to Proceed.

(b) Liquidated Damages: The Owner and the Contractor recognize that time is of the essence of this Agreement and that the Owner will suffer financial loss if the Work is not

completed within the times specified in paragraph (a) above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, the Owner and the Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor shall pay the Owner five-hundred dollars (\$500) for each day that expires after the time specified in Article 2 (a) for Completion until the Work is fully complete and the Owner issues a notice of Final Completion.

### Article 3. CONTRACT PRICE

The Owner shall pay the Contractor for completion of the Work in accordance with the Contract Documents in current funds as follows:

For all work required by the Contract Documents to be provided under the Base Bid the sum of: \_\_\_\_\_ (\$ \_\_\_\_\_)  
words figures

For the following Additional Bid items described on the Bid Form and awarded by the Owner:

#### Acts of God Insurance

Add an endorsement to the Contractor's Property Insurance to provide full replacement cost coverage in the amount of the Contract Price plus modifications thereto for physical loss or damage due to "Acts of God" including earthquakes of a magnitude of Richter 3.5 and above and tidal waves.

Add: \_\_\_\_\_ (\$ \_\_\_\_\_)  
words figures

#### The total Contract Price for all work awarded is:

\_\_\_\_\_ (\$ \_\_\_\_\_)  
words figures

### Article 4. RETAINAGE

(a) The Owner will withhold 5% as retainage from each progress payment due to the Contractor. Retainage shall be paid to the Contractor at the time of Final Payment as set forth in Article 13 of the General Conditions.

(b) When 50% of the Work has been completed and if the Contractor's work and progress have been satisfactory, the Engineer may recommend to the Owner that as long as the Contractor continues to perform satisfactorily the total amount withheld as retention need not be increased further.

(c) In accordance with California Public Contract Code Sections 10263 and 22300, the Contractor is hereby permitted to substitute securities of the kind listed below in place of the retention withheld in accordance with this section, or any other moneys withheld by the Owner to insure performance of this contract. At the request and expense of the Contractor, securities equivalent to the amount withheld may be deposited directly with a state or federally chartered

bank as the escrow agent, who shall pay such moneys to the Contractor at the time of Final Payment and upon satisfactory completion of this contract. The Owner is authorized to execute documents necessary for this purpose. The Contractor shall be the beneficial owner of any securities substituted for moneys withheld and shall be entitled to receive any interest thereon. Securities eligible for investment under this provision shall include those listed in Government Code, Section 16430, or bank or savings and loan certificates of deposit. The retention or other moneys withheld will not be released to the Contractor until the Owner has satisfied itself that the substitution of securities has been made in accordance with the provisions of this paragraph.

## **Article 5. PAYMENTS**

(a) Payments will be made to the Contractor for work performed at the times and in the manner provided in the Contract Documents. Payment will be made at bid prices for awarded Bid Items, plus amounts of approved Change Orders.

(b) The period covered by each Application for Payment shall be one calendar month ending on the last day of each month. The Owner shall make payment within 25 days after the Engineer issues a Recommendation for Payment.

## **Article 6. COMPONENT PARTS**

This Contract shall consist of the following documents, each of which is on file in the office of the Owner and all of which are incorporated herein and made a part hereof by reference thereto:

- (a) This Agreement
- (b) Performance Bond
- (c) Payment Bond
- (d) Notice of Award
- (e) General Conditions
- (f) Supplementary Conditions
- (g) Addenda Numbered \_\_\_\_\_ through \_\_\_\_\_ inclusive
- (h) General Requirements
- (i) Wage Rates
- (j) Technical Specifications
- (k) Drawings
- (l) Executed Change Orders, if any, which may be effective after the date of this Agreement.

There are no Contract Documents other than those listed above.

## **Article 7. CONTRACT REPRESENTATIONS**

In consideration of the Owner entering into this Agreement, the Contractor makes the following representations:

(a) The Contractor has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

(b) The Contractor has studied carefully all reports of explorations and tests of subsurface conditions and drawings of physical conditions which are identified in the Information Available to Bidders and accepts the limitations set forth in the General Conditions as to the extent to which the Contractor may rely on the information contained in such reports and drawings or otherwise provided by the Owner, the Design Engineer or the Engineer.

(c) The Contractor has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in this article which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, progress, performance or furnishing of the Work as the Contractor considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Article 3 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by the Contractor for such purposes.

(d) The Contractor has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing facilities, existing utilities, existing underground or concealed utilities and existing underground facilities at or contiguous to the site and accepts the limitations set forth in the General Conditions as to the extent to which the Contractor may rely on such information or on other information provided by the Owner, the Design Engineer or the Engineer. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect to said existing facilities, existing utilities, existing underground or concealed utilities and underground facilities are or will be required by the Contractor in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Article 3 of the General Conditions.

(e) The Contractor has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.

(f) The Contractor has given the Engineer written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution therefor by the Engineer is acceptable to the Contractor.

## **Article 8. CONTRACTOR DECLARATIONS**

The Contractor declares the Work will be conducted pursuant to the following additional requirements of the State of California:

(a) **Wage Scale:** Reference is hereby made to the rate of prevailing wage scale established by the State of California Director of Industrial Relations, a copy of which is available for inspection in the Owner's office, the provisions of which are hereby specified as the rate of prevailing wage to be paid workers on this project, and the provisions of Article 2, Chapter 1, Part 7, Division 2 (commencing with Section 1770) of the Labor Code shall be complied with.

(b) **Hours of Labor:** Eight-hour labor constitutes a legal day's work. The Contractor shall forfeit, as penalty to the Owner, twenty-five dollars (\$25.00) for each worker employed in

the execution of the contract by him or by any subcontractor, for each calendar day during which any worker is required or permitted to labor more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week, except as permitted by the provisions of Article 3, Chapter 1, Part 7, Division 2 (commencing with Section 1810) of the Labor Code of the State of California.

(c) Apprentices: In accordance with the provisions of Section 1777.5 of the Labor Code, and in accordance with the regulations of the California Apprenticeship Council, properly registered, apprentices may be employed in the prosecution of the work.

Information relative to number of apprentices, identifications, wages, hours of employment and standards of working conditions shall be obtained from the Director of the Department of Industrial Relations, who is the Administrative Officer of the California Apprenticeship Council.

(d) Prohibited Employment Discrimination: Attention is directed to Section 1735 of the California Labor Code, which reads 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 handicap, mental 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 this chapter."

(e) Workers' Compensation Insurance: In accordance with the provisions of Article 5, Chapter 1, Part 7, Division 2 (commencing with Section 1860) and Chapter 4, Part 1, Division 4 (commencing with Section 3700) of the California Labor Code, the Contractor is required to secure the payment of compensation to his employees and shall for that purpose obtain and keep in effect adequate Workers' Compensation Insurance.

The undersigned Contractor is aware of the provisions of Section 3700 of the Labor Code, which requires every employer to be insured against liability for Workers' Compensation claims or to undertake self-insurance in accordance with the provisions of that Code, and will comply with such provisions before commencing the performance of the Work in this contract.

(f) Security for Compensation: The Contractor hereby stipulates that the provisions of Section 1775 of the California Labor Code will be complied with. The Contractor further agrees to secure the payment of compensation to his employees in accordance with the provisions of Section 3700 of the California Labor Code.

(g) Contractor Claims Against Twain Harte Community Services District: Effective January 1, 1991, the California Legislature enacted a requirement that all contract claims of \$375,000.00 or less on local government public works contracts must be submitted to mediation and judicial arbitration. Article 1.5 (Sections 20104 through 20104.6, inclusive) of Chapter 1 of Part 3 of the Public Contract Code concerning Resolution of Construction Claims, is hereby incorporated into this agreement. See Supplementary Conditions for a summary of the timing provisions in Section 20104 through 20104.6.



(h) Contractor's License: The Contractor declares that it possesses a valid California Contractor's License of the required class at the time of signing this Agreement. The Contractor shall affirm its license number, classification and expiration date on this Agreement.

The following statement is included in accordance with Section 7030 of the California Business and Professions Code: "Contractors are required by law to be licensed and regulated by the Contractors State License Board. Any questions concerning a Contractor may be referred to the Registrar, Contractors State License Board, P.O. Box 26000, Sacramento, California 95826."

**Article 9. MISCELLANEOUS**

(a) Terms used in this Agreement, which are defined in Article 1 of the General Conditions, will have the meanings indicated in the General Conditions.

(b) No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

The Owner and the Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, the Owner has caused these presents to be executed in triplicate by its officers, thereunto duly authorized, and the Contractor has subscribed same, all on the day and year first above written. One counterpart each has been delivered to the Owner, the Contractor and the Design Engineer.

OWNER

TWAIN HARTE  
COMMUNITY SERVICES DISTRICT

(SEAL)

ATTEST:

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

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

Name \_\_\_\_\_

Name \_\_\_\_\_  
(Type or Print)

Title \_\_\_\_\_

Title \_\_\_\_\_

Address for giving notices \_\_\_\_\_

\_\_\_\_\_

CONTRACTOR:

\_\_\_\_\_

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

Name \_\_\_\_\_  
(Type or Print)

Title \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ (Federal Employer Identification Number)

\_\_\_\_\_  
*California Contractor's*  
License Class, License Number and License Expiration Date

Telephone Number (\_\_\_\_) \_\_\_\_\_

(SEAL)

If the Contractor is a corporation, attach evidence of authority to sign.

ATTEST:

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

Name \_\_\_\_\_

Title \_\_\_\_\_  
(Type or Print)

Address for giving notices \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

## CALIFORNIA ALL-PURPOSE ACKNOWLEDGEMENT

State of \_\_\_\_\_

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

On \_\_\_\_\_, before me, \_\_\_\_\_,

Name and Title of Officer

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

Name of Signer(s)

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

WITNESS my hand and official seal.

\_\_\_\_\_  
Signature of Notary Public

-----OPTIONAL-----

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document

**PART 1 - DESCRIPTION OF ATTACHED DOCUMENT**

Title of Type of Document: \_\_\_\_\_

Document Date: \_\_\_\_\_ Number of Page: \_\_\_\_\_

Signers) Other than Named Above: \_\_\_\_\_

**Capacity(ies) Claimed by Signer(s)**

Signer's Name: \_\_\_\_\_ Signer's Name: \_\_\_\_\_

- |  |  |
|--|--|
| <input type="checkbox"/> Individual  | <input type="checkbox"/> Individual  |
| <input type="checkbox"/> Corporate Officer   | <input type="checkbox"/> Corporate Officer   |
| <input type="checkbox"/> Title(s): _____   | <input type="checkbox"/> Title(s): _____   |
| <input type="checkbox"/> Partner <input type="checkbox"/> Limited <input type="checkbox"/> General | <input type="checkbox"/> Partner <input type="checkbox"/> Limited <input type="checkbox"/> General |
| <input type="checkbox"/> Attorney-in-Fact  | <input type="checkbox"/> Attorney-in-Fact  |
| <input type="checkbox"/> Trustee   | <input type="checkbox"/> Trustee   |
| <input type="checkbox"/> Guardian or Conservator   | <input type="checkbox"/> Conservator   |
| <input type="checkbox"/> Other _____   | <input type="checkbox"/> Other _____   |
| <input type="checkbox"/> Signer is Representing:   | <input type="checkbox"/> Signer is Representing:   |

END OF AGREEMENT

SECTION 00610

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that, WHEREAS, the Twain Harte Community Services District, hereinafter designated as the "Owner," Tuolumne County, State of Name of State has awarded to \_\_\_\_\_, hereinafter designated as the "Principal," a Contract, the terms and provisions of which Contract are incorporated herein by reference, for constructing the MCC Replacement Project, and

WHEREAS, said Principal is required under the terms of said Contract to furnish a bond for the faithful performance of said Contract;

NOW, THEREFORE, we, the Principal, and \_\_\_\_\_, as Surety, are held and firmly bound unto the Owner in the penal sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), lawful money of the United States, being one hundred percent (100%) of the Contract amount, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounden 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 faithfully perform the covenants, conditions, and agreements in the said Contract and any alterations made as therein provided, on his or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the Owner, its officers and agents, as therein stipulated, then this obligation shall be null and void; otherwise it shall be and remain in full force and virtue.

As a condition precedent to the satisfactory completion of the said Contract, the above obligation shall hold good for a period of 1 year after the completion and acceptance of the said work, during which time if the above bounden Principal, his or its heirs, executors, administrators, successors or assigns shall fail to make full, complete and satisfactory repair and replacements or totally protect the said Owner from loss or damage made evident during said period of 1 year from the date of acceptance of said work, and resulting from or caused by defective materials or faulty workmanship, in the prosecution of the work done, the above obligation shall be and remain in full force and virtue.

And the said Surety, for value received, hereby stipulates and agrees to waive the provisions of California Civil Code Section 2819 regarding consent to change, extension of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any wise 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 the event the Owner or their successors or assigns, shall be the prevailing party in an action brought upon this bond, then, in addition to the penal sum herein above specified, we agree to pay to the Owner or their successors or assigns, all reasonable attorney's fees, costs and expenses incurred, which sum shall be fixed by the court.

IN WITNESS THEREOF, the above bounden parties have executed this instrument under their seals this \_\_\_\_\_ day of \_\_\_\_\_, 2022, the name and corporate seal of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

ATTEST:

\_\_\_\_\_  
(SEAL)

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Witness as to Principal

By \_\_\_\_\_ (s)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Address)

ATTEST:

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

\_\_\_\_\_  
(Witness to Surety)

\_\_\_\_\_  
(Attorney-in-Fact)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Address)

If Contractor is partnership, all partners must execute bond.

END OF PERFORMANCE BOND

SECTION 00620

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS:

That we, \_\_\_\_\_,  
as Principal, and \_\_\_\_\_,  
organized and existing under the laws of the State of \_\_\_\_\_, and  
authorized to execute bonds and undertaking as sole surety, as Surety, are held and firmly  
bound unto any and all persons named in California Civil Code Section 3181 whose claim has  
not been paid by the Contractor, company or corporation in the aggregate total of  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)  
(being 100% of the Contract amount) for the payment whereof, well and truly to be made, said  
Principal and Surety bond themselves, their heirs, administrators, successors, and assigns,  
jointly and severally, firmly by these presents.

The condition of the foregoing obligation is such that, whereas the above bounden  
Principal has entered into a Contract dated \_\_\_\_\_, 20\_\_\_\_, with Twain  
Harte Community Services District to do the following work, to-wit: Construct the MCC  
Replacement Project.

NOW, THEREFORE, if the above-bounden Principal or his subcontractors fail to pay any  
of the persons named in Section 3181 of the Civil Code of the State of California, or amounts  
due under the Unemployment Insurance Code with respect to work or labor performed under  
the Contract, or for any amounts required to be deducted, withheld, and paid over to the  
Employment Development Department from the wages of employees of the Contractor and his  
subcontractor pursuant to Section 13020 of the Unemployment Insurance Code of the State of  
California, with respect to such work and labor, the surety will pay for the same, in the amount  
not exceeding the sum specified in this bond, and also, in case suit is brought upon this bond, a  
reasonable attorney's fee, to be fixed by the Court.

This bond shall inure to the benefit of any person named in Section 3181 of the Civil Code  
of the State of California so as to give a right of action to them or their assignees in suit brought  
upon this bond.

This bond is executed and filed to comply with the provisions of the act of Legislature of  
the State of California as designed in Civil Code Sections 3247 to 3252, inclusive, and all  
amendments thereto.

And the said Surety, for value received, hereby stipulates and agrees to waive the  
provisions of California Civil Code Section 2819 regarding consent to change, extension of time  
alteration, or addition to the terms of the Contract, or to the work to be performed thereunder, or  
the Specifications 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, the above bounden parties have executed this instrument  
under their seals this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, the name and



corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

ATTEST:

\_\_\_\_\_  
Principal Secretary

\_\_\_\_\_  
Principal

(SEAL)

By \_\_\_\_\_ (s)

\_\_\_\_\_  
Witness as to Principal

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Address)

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

ATTEST:

\_\_\_\_\_  
(Witness to Surety)

\_\_\_\_\_  
(Attorney-in-Fact)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Address)

If CONTRACTOR is a partnership, all partners must execute BOND.

END OF PAYMENT BOND

**SECTION 00700**  
*(00 72 00)*  
**GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT**

**USE NOTES**

The following text highlights the latest changes to Section 00700 General Conditions. Division 0 and 1 Guide Specifications incorporate the updated changes and cross references to Section 00700.

**Article 1: Definitions**

1.2: “Contract Documents” do not include the bid. Transfer the numbers from the bid to the Agreement Form 00500.

**Article 4: Bonds and Insurance**

4.1: **Performance and Payment Bonds.** The length of time for each bond to remain in effect has changed and should be reviewed by counsel for the Client. The Surety for each bond must be on the U.S. Treasury’s Circular 570, which is accessible on the Internet. The Client should verify each surety is acceptable.

4.3: **Insurance Requirements.** These requirements are new, detailed and extensive. They are important protection for the Client and Kennedy/Jenks. Specific ISO (Insurance Services Office) Endorsement forms are required. Newer versions are not acceptable as they often limit the extent of coverage.

4.4: **Certificates of Insurance.** Certificates of Insurance and endorsements to the Contractor’s policies are required to be provided to the Owner and Engineer before the work begins and along with the Application for Final Payment.

**Article 5 – Contractor**

Contractor’s Construction Schedule

5.16: Detailed CPM schedules are required.

5.17: Float has been allocated in the Agreement. The Contractor waives all claims for compensation due to delays, interference or acceleration. The Contractor is entitled only to an extension of time of the contract. Counsel for the Owner should review this provision because many states limit its enforceability.

5.32: **Indemnification.** This changed provision provides more protection to the Owner and Kennedy/Jenks than the prior provision.

5.36: **Escrowed Bid Documents.** The Owner should consider whether to require bid documents to be escrowed. If not, 5.36-5.39 may be deleted by using the Supplementary Conditions.

**Article 7 Administration of the Contract**

7.8: **Requests for Information (RFI) and Responses:** This is a new form, GC-1 that the contractor must use to request information and we should use to respond. We no longer use “clarifications” as a response to a RFI because in most instances there is not an ambiguity in the documents, just an inability of the Contractor to find the answer.

## Article 8 – Submittals

8.3: Proposed Equivalent Form, GC-3 must be used by the Contractor as it contains a number of certifications and specific information that we must rely upon in considering the request.

8.8: **Intent of Contractor’s Review:** Submittals must be on the Submittal Form, GC-2, as it contains a number of certifications.

## Article 9 – Changes in the Work

9.4: **Change Orders.** This provision has been modified to include a waiver of known and **unknown claims** by the **OWNER** and Contractor, unless expressly reserved. The reservation should be on the Change Order. This should help to limit the Contractor’s further requests for time or money after the Change Order has been executed.

## Article 10 – Claims and Disputes

10.6: **Mediation.** Should direct negotiations not resolve a dispute, controversy or claim, then Mediation is the next step before a lawsuit or arbitration.

## Article 13 – Payment and Completion

13.1: **Schedule of Values.** This submittal form is left to the discretion of the Engineer, but should be detailed enough to evaluate Applications for Payment which should use the same schedules and values (but not the same form).

13.2: **Application for Payment.** The Form, GC-4 and the timing has changed. The Form should be used as it contains certifications by the Contractor and a Recommendation (not a certification) by the Engineer. GC-4 is a Microsoft Excel Template.

13.4: **Engineer’s Recommendation for Payment.** We do not certify Applications, we make recommendations to Owners. Owners may withhold additional amounts based upon legal, insurance or other considerations. The timing has changed for issuance of our recommendations.

13.9: **Contractor’s List of Deficiencies:** Previously known as a Punch List, the Contractor now prepares it and we review and modify it as necessary. The sequence of its preparation, our Semi-Final Inspection, and Final Inspection has been modified and is important. These provisions place upon the Contractor the responsibility to determine substantial completion before we go to the site, otherwise the Contractor will pay for our unnecessary site visits.

**SECTION 00700  
GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT**

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**SECTION 00700**  
**GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT**

**ARTICLE 1 - DEFINITIONS**

1.1 The term "Contract" refers to a single identified portion of the construction which may be the whole or a part of the Project. The Project is the total construction and consists of one or more Contracts performed by the same or separate contractors or by the Owner. A single set of drawings, specifications and contract conditions may include more than one Contract; when combined with the Agreement for an individual Contract they become the Contract Documents for that Contract. The construction performed under a set of Contract Documents is the Work required by an individual Contract.

1.2 The "Contract Documents" consist of the Agreement, General and Supplementary Conditions, Drawings, Specifications, Addenda issued prior to executing the Agreement and modifications issued after executing the Agreement.

1.3 The term "Contract Price" refers to the total monies payable to the Contractor for completion of the Work in accordance with the Contract Documents.

1.4 The term "Design Engineer" refers to the firm that prepared the Contract Documents - Kennedy/Jenks Consultants - and includes all of their officers, directors, shareholders, employees and consultants.

1.5 The term "Drawings" refers to the graphic and pictorial portion of the Contract Documents, showing the design, location, dimensions, details, scope and character of the Work. Drawings may include plans, elevations, sections, schedules, details and diagrams.

The terms Plans, Plan, Drawing and similar terms shall have the same meaning as the term "Drawings."

1.6 The term "Engineer" refers to the person or entity designated by the Owner to provide administration of the Contract.

1.7 The term "Notice to Proceed" refers to a written notice by the Owner to the Contractor authorizing it to proceed with the Work and establishing the date of commencement from which the Contract Time is measured.

1.8 The term "Owner" is the person or entity referred to in the Agreement and includes all of its officers, employees, and consultants.

1.9 The term "Work" means the entire construction required by the Contract Documents completed or in progress and includes all labor, materials, equipment and services necessary to fulfill the Contractor's obligations. The Work does not include the Contractor's tools, equipment, scaffolding, shoring, barricades, guardrails or any other temporary construction or safety devices employed by the Contractor to complete the Work.

1.10 Definitions of other terms are included at the beginning of each Article or in Division 1 Section 01010.

**ARTICLE 2 - CONTRACT DOCUMENTS**

**Contract Relationships**

2.1 The Contract Documents constitute the entire Agreement between the Owner and the Contractor for the Work and supersede prior agreements written or oral.

2.2 The Contract Documents shall not be construed to create a duty of any kind (1) on behalf of the Design Engineer or the Engineer and toward the Contractor, any subcontractor, worker, or any other party, or (2) on behalf of the Owner and toward any subcontractor, worker, or any other party.

2.3 Provisions in referenced standards, specifications, manuals, publications, installation instructions, operation and maintenance instructions or codes shall not change the duties or responsibilities between any of the parties involved in this work from those described in these General Conditions.

**Correlation, Intent**

2.4 It is the intent of the Contract Documents to include everything necessary for the proper execution of the Work as a complete functioning facility that serves the intended purpose. The Contractor shall provide all labor, material, equipment and services required by the Contract Documents or that may

reasonably be inferred from the Contract Documents as being required to produce the intended result.

2.5 The Contract Documents are complementary: What is required by one shall be as binding as if required by all. Organization of the Specifications into sections and the arrangement of the Drawings on separate sheets for Mechanical, Electrical, etc. shall not control the Contractor in dividing the Work among subcontractors or among trades.

### **Order of Precedence**

2.6 In case of conflict between different parts of the Contract Documents, the order of precedence shall be as follows:

- .1 Supplementary Conditions take precedence over the General Conditions and the Specifications including Division 1;
- .2 General Conditions take precedence over the Specifications including Division 1;
- .3 Provisions in Division 1 General Requirements apply to all sections of the Specifications.
- .4 Specifications take precedence over the Drawings;
- .5 Stated dimensions take precedence over scaled dimensions;
- .6 Larger scale drawings take precedence over smaller scale drawings;
- .7 Detailed drawings take precedence over general or typical drawings;
- .8 Specific notes on the Drawings take precedence over schedules; and
- .9 Notes, descriptions or schedules take precedence over graphic representations on drawings.
- .10 Higher quality takes precedence over lower quality.
- .11 Greater number, amount or size takes precedence over lesser number, amount or size.

2.7 The Contractor will be furnished three (3) one-half (½) size Drawings sets, 3 copies of the Project Manual, 1 PDF copy of each and the Contractor may obtain additional copies at their cost of reproduction.

### **Use of Contract Documents**

2.8 The Drawings, Specifications and other documents prepared by the Design Engineer, are instruments of service to which the Design Engineer retains legal title, including copyright rights. These instruments of service shall not be used on other projects, for subsequent changes to this project, and shall not be

changed or modified without the written permission of the Design Engineer.

2.8.1 Nothing herein shall relieve the Contractor of its obligation to notify the Owner of any inconsistencies in the Contract Documents. Should it appear that the Work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Contract Documents or in the event of a conflict, inconsistency or discrepancy in the Contract Documents, the Contractor shall immediately submit an RFI to the Owner in writing for such further written explanations as may be necessary. Any adjustment(s) to the Work made by Contractor without first obtaining written clarification from the Engineer shall be at Contractor's risk and expense and shall be subject to removal if required by Owner.

2.8.2 Contractor Deviations. No deviation by the Contractor from the Contract Documents relating to any portion of the materials, labor services or equipment required for the Work shall be construed to set a precedent with respect to subsequent interpretation of the Contract Documents or performance of the Work unless such a deviation is documented in a Change Order to the Contract.

## **ARTICLE 3 - LAND, EXISTING CONDITIONS, LAYOUTS**

### **Land**

3.1 The Owner shall furnish access to the land on which the Work is to be performed including rights-of-way and easements for access. The Contractor shall confine its operations to the land furnished or to that portion of the land indicated on the Drawings. The Contractor shall provide all other land that it may require.

### **Existing Conditions**

3.2 Execution of the Agreement by the Contractor is a representation that the Contractor has visited the site and has become familiar with existing and local conditions which may affect the Work and has included all costs associated therewith in its Bid.

### **Subsurface Soil Conditions**

3.3 If information on subsurface soil conditions was obtained for design purposes, the Contractor may rely on the boring logs as a representation of soils that existed at the location of the boring at the time the borings were made but may not rely on the interpretations or opinions contained in the report nor

on the completeness or adequacy of the information for the Contractor's bidding or construction purposes.

### **Existing Utilities and Underground Facilities**

3.4 Information shown with respect to existing concealed or underground utilities and underground facilities is based on data provided by the utility or facility owners or by others. The Contractor may rely on the information shown in the Contract Documents for purposes of establishing the Scope of Work included in the Contract Price but the Owner and the Design Engineer are not responsible for the adequacy or completeness of such information for the Contractor's bidding or construction purposes.

### **Existing Structures**

3.5 Information on existing structures and facilities including concealed utilities was obtained from such records as were available from facility owners and not from exhaustive field investigations. The Contractor may rely on technical data for existing structures and facilities including concealed utilities when such data are shown in the Contract Documents but not on the completeness or adequacy of such data for the Contractor's bidding or construction purposes.

### **Contractor Responsible for Damage**

3.6 The Contractor shall be responsible for:

- .1 verifying the existence and location of all utilities and underground facilities, including the use of potholing, hand excavations and hand demolition;
- .2 coordinating work with utility and facility owners;
- .3 protection of concealed and underground utilities and underground facilities from damage;
- .4 the repair or replacement of utilities or underground facilities damaged by the Contractor's failure to exercise reasonable care; and
- .5 damage to others due to loss of utility service resulting from the Contractor's operations.

### **Differing Conditions**

3.7 If the Contractor encounters: (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character covered by these Contract Documents, (3) material that the Contractor believes may be hazardous waste as defined by law, the Contractor shall immediately report them to the Engineer.

Failure to notify the Engineer of a differing condition prior to performing additional work shall prejudice the Owner and shall be a waiver by Contractor of any and all claims arising from the differing conditions. If the Engineer determines that conditions encountered are materially different from those indicated in the Contract Documents or ordinarily encountered in work of the character required and that the differing conditions cause a change in the Contractor's cost or time, it will recommend an equitable adjustment in Contract Price and/or Time. The Contractor's failure to notify the Owner of differing conditions that cause a reduction in the Contractor's cost or time shall not affect the Owner's right to make a Claim for adjustment in Contract Price and/or Time. If either the Contractor or the Owner disagrees with the Engineer's recommendation, they may make a Claim under Article 10.

### **Contractor Responsible for Safety Precautions**

3.8 The Contractor shall take all precautions required to protect workers and others from known and unknown or concealed hazards including verifying the location of concealed and underground utilities and underground facilities with utility and facility owners, potholing, hand excavation and hand demolition and shall not rely on the adequacy, accuracy or completeness of information provided in the Contract Documents or elsewhere by the Owner, the Engineer or the Design Engineer. The Contractor shall be solely responsible for and take all responsibility for safety in, on, or about the site.

### **Reference Points, Layout**

3.9 The Owner shall provide reference points to establish property corners, a baseline and an elevation. The Contractor shall protect reference points provided by the Owner and shall reset any that are damaged. The Contractor shall hire a surveyor licensed in the state where the project is being built to reset and document baseline reference points, elevation bench marks and property corners that are damaged.

3.10 The Contractor shall layout the Work from the reference points provided and shall be responsible for accurate location, alignment, elevation and level of the completed Work.

## **ARTICLE 4 - BONDS AND INSURANCE**

### **Performance and Payment Bonds**

4.1 The Contractor shall furnish Performance and Payment Bonds, each in an amount equal to the



Contract Price as security for the faithful performance and payment of the Contractor's obligations under the Contract Documents. The Payment Bond shall remain in effect for at least two (2) years after final acceptance. The Performance Bond shall remain in force the greater of: (a) four (4) years after final completion and final acceptance of all work, or (b) until the expiration of all Warranties and Guarantees as required by the Contract Documents. All Bonds shall be in the forms prescribed by law and by the Contract Documents and be executed by Sureties named in the current list of "Certified Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds or Certified Reinsurer Companies Holding Certificates Of Authority As Acceptable Reinsuring Companies" published in Circular 570 (most recent amendment) by the Audit Staff Bureau of Accounts, U.S. Treasury Department ([www.fms.treas.gov/c570/index.html](http://www.fms.treas.gov/c570/index.html)) and is admitted to issue bonds in the states in which the Project is located and all Work is performed. If the Surety is declared bankrupt or becomes insolvent or its right to do business is terminated by the state where the Work is located or if it ceases to meet the foregoing listing requirement, the Contractor shall provide another Bond meeting the stated requirements. All Bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

4.2 Sureties shall specifically waive all rights of notice of and consent to change, extension of time, alteration or addition to the terms of the Contract. The Contractor shall be responsible for notifying Sureties of all events that may affect them.

### **Insurance Requirements**

4.3 The Contractor shall, at its sole cost, obtain and maintain, in force and effect for the duration of the Contract, including the Guarantee and Warranty periods, insurance of the following types with limits not less than those set forth below, in a company or companies with a Best's rating of no less than A:VII and admitted to issue insurance in the jurisdiction(s) in which all work is to be performed, where the site is located and where any waste is transported or deposited. The Contractor shall require compliance with these Insurance Requirements by its lower tier subcontractors:

.1 Workers' Compensation Insurance, including occupational illness or disease coverage, in accordance with the laws of the nation, state, territory or province having jurisdiction over the Contractor's employees and Employer's Liability Insurance with limits the greater of the statutory requirements, or \$1,000,000 per accident and, for bodily injury by disease, \$1,000,000 per employee. Coverage shall include all work covered under the U.S. Longshoreman's and Harbor Workers'

Compensation Act and Jones Act. The Contractor shall not utilize occupational accident or health insurance policies, or the equivalent, in lieu of mandatory Workers' Compensation insurance, or otherwise attempt to opt out of the statutory Workers' Compensation system. This insurance shall contain a waiver of subrogation against the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants.

.2 Commercial General Liability Insurance (Occurrence Form) ISO Form CG 00 01 12 04 with a full defense and indemnity, and unless modified in the Supplementary Conditions, shall include:

(a) a minimum combined single limit of liability of \$3,000,000 or the limits required by law, whichever is greater for each occurrence for bodily injury and property damage;

(b) a minimum limit of liability of \$3,000,000 each person for personal and advertising injury liability;

(c) a minimum limit of liability of \$3,000,000 each occurrence for products/completed operations liability. The products/completed operations liability shall be maintained in full force and effect for not less than 10 years following completion of any of the Contractor's work;

(d) a general aggregate limit of not less than \$3,000,000, which shall be provided on a per project basis by means of ISO Endorsement CG 25 03 11 85 or approved equivalent;

(e) an endorsement that names the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants as additional insureds. Such endorsement shall be made upon an ISO Endorsement CG 20 10 11 85 or approved equivalent (CG 20 10 04 13 is not equivalent or acceptable), Additional Insured - Owners, Lessees or Contractor (Form B) and shall state "insurance is primary and all other insurance shall be noncontributory" and shall waive all rights of subrogation against the additional insureds;

(f) XCU coverage for claims arising from explosion, collapse and underground damage;

(g) Pollution Impairment Liability coverage of not less than \$1,000,000;

(h) Contractual liability coverage for all oral and written contracts including the indemnity provisions contained herein;

(i) Deductibles shall not exceed \$5,000 per occurrence and shall be the sole responsibility of the Contractor;

(j) Cross Liability, Separation of Insureds endorsement, or coverage for Severability of Interest shall be included;

(k) Claims made policies are not acceptable;

(l) Coverage for Work performed on or within 50 feet of a railroad, by deletion of any limitation or exclusion of coverage on or within 50 feet of a railroad or by a Railroad Protective Liability policy which complies with Article 4.3.2 (a), (d), (e), and (h)-(k).

.3 Automobile Liability Insurance covering use of all owned, non-owned and hired automobiles with a minimum combined single limit of liability for bodily injury and property damage of \$3,000,000 per occurrence, and shall include:

(a) An endorsement that names the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants as additional insureds, states such "insurance is primary and all other insurance shall be noncontributory", and waives all rights of subrogation against the additional insureds;

(b) Cross Liability, Separation of Insureds endorsement, or coverage for Severability of Interest;

.4 Property Insurance shall be on an all-risk policy form and shall include:

(a) A minimum limit of liability in the amount of the initial Contract Price as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles;

(b) The interests of the Owner, the Contractor, the Engineer, and the Design Engineer and each of their officers, employees, agents, consultants, and all tiers of subcontractors, all of whom shall be listed as insureds or additional insureds and the policy shall, by endorsement, waive all rights of subrogation against the insureds and additional insureds and the endorsement shall state: "Subrogation: This insurance shall not be invalidated should the named Insured waive in writing prior to a loss, any right of recovery against any person for loss occurring to the property described.";

(c) Coverage for the Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, the Contractor shall bear all reasonable costs properly attributable thereto;

(d) Coverage against the perils of fire and extended coverage and all physical loss or damage including, without limitation or duplication of coverage:

(i) lightning, windstorm, hail, smoke, explosion, riot, riot attending a strike, civil commotion, aircraft and vehicles;

(ii) theft, vandalism, malicious mischief, and water damage;

(iii) collapse, flood including tidal waves or overflow from bodies of water, landslide, water pressure or earth movement and earthquake;

(iv) removal of debris resulting from an insured loss and demolition occasioned by enforcement of any applicable legal requirements;

(v) falsework, temporary buildings and safety devices used by the Contractor to perform the Work;

(vi) portions of the Work stored on and off the site and in transit when such portions of the Work are included in an Application for Payment (including Inland Marine coverage and Installation and Equipment Floater coverage as applicable);

(vii) and shall cover compensation for the services of the Design Engineer and the Engineer required as a result of the insured loss.

(viii) flood and tidal wave insurance coverage shall be for the maximum percentage of the Contract Price permitted by law.

(e) Remaining in full force and effect until the Final Payment has been made to the Contractor. The property insurance policy shall be endorsed to allow for partial use or occupancy by the Owner without permitting a cancellation or lapse of insurance coverage;

(f) Deductibles shall not exceed \$5,000 per occurrence with a deductible aggregate of \$5,000. The Contractor shall pay for deductible losses at no cost to any other insured or additional insured.

.5 Boiler and Machinery Insurance shall be provided as required by the Supplementary Conditions or by law.

### **Certificates of Insurance**

4.4 Prior to beginning any Work, the Contractor shall file with the Owner, Design Engineer and Engineer, Certificates of Insurance in a form satisfactory to Owner and Engineer (ACCORD form) along with a copy of all endorsements as required in Article 4.3. The certificates shall name each additional insured required by these General Conditions, shall state "insurance is primary and all other insurance shall be noncontributory", shall waive all rights of subrogation against the additional insureds; and shall also contain a provision that the Owner, Design Engineer and Engineer shall be notified in writing 30 days before the policies may be canceled or allowed to expire or any reduction in coverage. An additional certificate shall be submitted with the final Application for Payment showing required continuation of coverage beyond the Final Payment.

### **Property Insurance: Adjustment of Loss**

4.5 A loss insured under the Contractor's property insurance shall be adjusted with the Contractor and made payable to the Contractor as fiduciary for the

insured, as their interests may appear subject to the requirements of any applicable mortgage clause. The Contractor shall deposit the insurance proceeds in a separate account, and shall distribute payment to the parties in proportion to their cost for repairing or replacing the damaged Work. The Contractor shall provide a complete audited accounting of the distribution of insurance proceeds to all parties of interest.

## **ARTICLE 5 - CONTRACTOR**

5.1 As a material inducement to enter into this Agreement, Contractor represents it and its subcontractors are skilled in the type of work required by the Contract Documents and is licensed in accordance with applicable law. The Contractor shall perform at least ten percent of the dollar value of the Work using personnel on its own payroll.

### **Supervision**

5.2 The Contractor shall supervise and direct the Work using its best skill and attention. The Contractor shall employ a competent superintendent to represent the Contractor at the site at all times work is being performed. The Superintendent shall not be replaced without reasonable cause and notice to the Engineer. Communications given to the Superintendent shall be as binding as if given to the Contractor.

### **Contractor Responsible for Means and Methods**

5.3 The Contractor shall be solely and completely responsible for and have control over construction means, methods, techniques, sequences, procedures and safety and for coordinating all portions of the Work under the Contract Documents. The Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants shall not be responsible for any construction means, methods, techniques, sequences, nor for safety in, on or about the site, nor for coordinating any part of the Work.

### **Labor, Material and Equipment**

5.4 The Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, communications, and other facilities and services necessary for the proper execution and completion of the Work.

5.5 The Contractor warrants to the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants that materials and equipment furnished under the Contract will be of

good quality, that the Work will be free from defects, that all material, equipment, hardware, software and firmware products provided to the Project will strictly conform with the requirements of the Contract Documents. If required by the Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Work not conforming to these requirements, including Proposed Equivalents not Favorably Reviewed, may be considered defective. The Contractor's warranty excludes remedy for damage caused by the Owner's abuse, modification, improper maintenance, improper operation, or normal wear.

5.6 The Contractor shall enforce strict discipline and good order among persons performing the Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

5.7 The Contractor shall be responsible to the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants for the acts and omissions of the Contractor's employees, subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.

### **Subcontractors and Suppliers**

5.8 Unless listing subcontractors at the time of bidding is required by the bidding documents, the Contractor shall furnish a list of all subcontractors whose work amounts to one-half percent or more of the Contract Price prior to beginning construction. The Contractor shall not contract with any subcontractor to whom the Owner or the Engineer has made reasonable and timely objection.

5.9 Contracts between or among the Contractor, suppliers and subcontractors shall (1) require each supplier and subcontractor to be bound to the Owner, Engineer and Contractor by the terms of these Contract Documents, and to assume toward the Contractor, the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants all the obligations and responsibilities including but not limited to insurance and indemnity requirements which the Contractor, by these Contract Documents, assumes toward the Owner, the Design Engineer and the Engineer, and (2) at the Owner's option, provide for the assignment of subcontracts to the Owner at Owner's request.

## **Taxes, Permits, Fees and Notices**

5.10 The Contractor shall pay sales, consumer, use, and other similar taxes which are legally enacted when bids are received. The Contractor shall secure and pay for the building permit (less the Plan Review fee) and other permits and governmental fees, licenses and government required inspections necessary for proper execution and completion of the Work including utility connection fees. The Owner will submit the Drawings, Specifications and other required data to the Building Official prior to bidding and will pay for the Plan Review fee. The Owner will pay capital cost assessments such as plant investment fees required by utility owners.

5.11 The Contractor shall give all notices and shall comply with all laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on furnishing and performing the Work.

## **Patents**

5.12 The Contractor shall include in its bid and shall pay royalties and license fees required for the use of all patents. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants harmless from loss on the account thereof.

## **Documents at the Site, Record Drawings**

5.13 The Contractor shall keep a complete set of Contract Documents including all modifications and all favorably reviewed submittals at the site. The Contractor shall prepare Record Drawings by neatly adding the following information in ink at least once a week to a set of Contract Drawings: (1) references to Contract modifications including Responses to Request For Information, minor changes and Change Orders; (2) as-built work that differs from work shown on the Contract Drawings; and (3) the dimensioned, as-installed location of major underground and concealed utilities, conduits, piping, tanks, facilities and similar items. Record Drawings shall be made on a clean copy of the Contract Drawings furnished under General Conditions paragraph 2.7 and not used for any other purposes. The Contractor shall make Record Drawings available to the Engineer to verify progress. The Contractor shall submit and obtain favorable review of the Record Drawings prior to Final Acceptance.

## **Review of Contract Documents and Field Conditions**

5.14 Before starting work, the Contractor shall carefully study and compare the Contract Documents with each other and with existing site conditions and field

measurements. The Contractor shall immediately report any discovered deficiencies including code violations to the Engineer, in writing. The Contractor is not responsible for finding all deficiencies but will be held responsible for construction required to correct deficiencies or code violations that the Contractor had knowledge of or should reasonably have had knowledge of and did not report to the Engineer in writing.

## **Contractor's Construction Schedule**

5.15 Within 10 days after the date in the Notice to Proceed and prior to the commencement of any onsite work, Contractor shall submit:

.1 a temporary construction schedule covering the first 60 days of the Contract Time. The submittal shall be graphic and in electronic form. The electronic information submitted shall include files using the specified scheduling software format, if specified, and an easily readable file such as Adobe Acrobat PDF;

.2 a proposed Critical Path construction schedule, which shows each constituent operation, quantity, rate and period required to accomplish the Work;

.3 the proposed method of procedure, which enumerates the methods and equipment to be employed during each phase of the Work; and

.4 a plan, which indicates the storage and working areas desired to accomplish the construction and is acceptable by the Engineer and the Owner.

5.16 Within 30 days after the date in the Notice to Proceed, the Contractor shall prepare and submit for the Owner's and the Engineer's information a construction schedule for the Work. Unless a specific type of schedule is specified in Division One, the form of schedule may be selected by the Contractor if acceptable by Engineer, and the schedule shall show the beginning and ending date for each major construction task by each trade and the interdependencies between tasks, and shall identify the critical sequence of tasks (or "Critical Path") that determines the shortest time required to complete the Work. The construction schedule shall: (i) not exceed the Contract Time and Milestone dates established in the Contract Documents; (ii) be updated at monthly intervals or as requested by the Engineer; (iii) be related to the entire Project; and (iv) provide for expeditious and practicable execution of the Work. The schedule shall reflect input from the Contractor's subcontractors and suppliers, shall include an allowance for normal unfavorable weather and enough

float time to accomplish all clarifications, requests for information, all submittals and changes required in the Contract Documents, and shall not exceed time limits specified in the Contract Documents. If the Contractor's schedule shows a shorter construction period than provided in the Contract Documents, the Contractor's schedule shall be a Critical Path Method (CPM) type schedule, shall be prepared in sufficient detail to demonstrate the feasibility of early completion and shall be submitted within 30 days after beginning construction. This CPM schedule shall show all required submittals and dates for ordering, shipping and receiving critical materials and equipment. Contractor's submittals shall be submitted with sufficient time to permit 30 days for a response and not impact Contractor's schedule. The submittals shall be graphic and in electronic format. The electronic information submitted shall include files using the specified scheduling software format, if specified, and an easily readable file such as Adobe Acrobat PDF.

5.16.1 Format. Unless otherwise provided in the Specifications, the construction schedule shall be in a detailed precedence Critical Path Method ("CPM") or Primavera-type format satisfactory to the Engineer, which shall also: (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase, design, construction and maintenance; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as Milestone dates). At a minimum the Construction Schedule shall depict the schedule or Work on a discipline by discipline and trade by trade basis and tasks within each discipline and trade. The Construction Schedule shall include (i) proposed activity sequences and durations showing the amount of Float for each activity; (ii) Milestone dates for receipt and acceptance of pertinent information, including Owner-supplied information and approvals by public authorities having jurisdiction over the Project; (iii) dates for preparation and processing of Submittals; (iv) dates for delivery of materials or equipment requiring long-lead time procurement; (v) Owner's occupancy /use requirements showing portions of the Project having occupancy priority; (vi) the dates of Substantial and Final Completion; and (vii) other information reasonably required by Owner.

5.16.2 Updates. With each Application for Payment submitted by Contractor (other than the final Application for Payment), the Contractor shall submit to the Engineer an updated construction schedule revised to indicate the portion of the Work executed, all progress slippages, corrective actions taken, or slippage carry-over, for all anticipated delays of difficulties, and all other

information required to accurately present the actual status of the progress of the Work as of the date of the Application for Payment. If the Contractor does not submit an updated construction schedule with an Application for Payment, Owner shall withhold payment, in whole or in part. In the event any update to the Project Schedule indicates any delays to the Contract Time that are the fault of Contractor or others for whom Contractor is responsible, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary.

In no event shall any construction schedule update constitute an adjustment in the Contract Time, any deadline, or the Contract Price unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

5.16.3 Daily Logs. Contractor shall maintain a daily log containing a record of weather, Contractor's own forces working on Site; Subcontractors working on the Site; number and labor classification of workers or each Subcontractor on Site; materials delivered; major equipment on Site, Work started, completed and accomplished that day; approximate count of all personnel at the Project Site; inspections tests and visitors; accidents, any Work stoppages, delays, shortages or losses; problems encountered and other similar relevant data as the Owner may reasonably require. The daily log shall be signed by Contractor's Superintendent, submitted by 4:30p.m. on the next Working Day to Engineer and shall be made available to others as directed by Owner.

5.16.4 Performance. The Contractor shall perform the Work in accordance with the most recent construction schedule and schedule of Submittals accepted by the Owner. The Contractor shall monitor the progress of the Work or conformance with the requirements of the Construction schedule and shall promptly advise the Engineer and Owner of any delays or potential delays.

5.16.5 Extraordinary Measures. In the event the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including without limitation: (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities and (iii) submitting a recovery schedule for re-sequencing performance of the Work or other similar measures. Such corrective measures shall continue until the progress of the Work complies with the stage of completion as required by the Contract Documents. The Contractor shall not be entitled to an adjustment in the Contract Price in connection with the

corrective measures required by the Owner under or pursuant to this section. The Owner may exercise these rights pursuant to this section as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with the Contract Time or interim completion dates set forth in the Contract Documents. If Contractor or its Subcontractors fail to implement or commence corrective measures within ten (10) calendar days of Owner's written demand, Owner may, without prejudice to other remedies take corrective action at the expense of the Contractor and shall reduce the Contract Price.

5.17 It is agreed that the Contract Price includes the Contractor's office and field overhead, profit and related charges for the full Contract Time. The Contractor may, at its option, complete the Work in a shorter period than the Contract Time but the Contractor may not make a claim for extended overhead or other charges for: (1) delays that extended completion beyond the date planned by the Contractor but not beyond the Contract Time, and (2) delays contemplated by the Contractor and the Owner. All float in the schedule shall first be for the benefit of the Owner, the Engineer, the Design Engineer and then for the benefit of the Contractor. To the fullest extent permitted by law, the Contractor on behalf of itself and its subcontractors, waive any and all claims for damages attributable to delays, interference, or acceleration caused by the Owner, the Engineer, the Design Engineer and each of their officers, employees, agents and consultants and the Contractor and its subcontractors shall be entitled to an extension of the Contract Time as their exclusive remedy.

5.18 The construction schedule shall provide for expeditious and practicable execution of the Work and shall be revised and submitted monthly unless excused by the Engineer in writing. The Contractor shall conform to the most recent schedule.

5.19 The Contractor shall prepare and keep current, for the Engineer's information, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows 30 days for the Engineer's review of each submittals and 30 days for review of each resubmittal.

#### **Safety of Persons and Protection of Property**

5.20 The Contractor shall be solely and exclusively responsible for construction safety means and methods and for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of this Contract.

5.21 The Contractor shall take all necessary precautions for safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's subcontractors or sub-subcontractors; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

5.22 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

5.23 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, necessary fences and other safeguards for safety and protection of persons and property on and off the site and shall: (1) post danger signs and other warnings against hazards, (2) promulgate safety regulations, and (3) notify owners and users of adjacent sites and utilities when the Contractor's operations may affect them.

5.24 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry out such activities under supervision of properly qualified personnel.

5.25 The Contractor shall promptly remedy damage and loss to property that the Contractor is required to protect caused in whole or in part by the Contractor, a subcontractor, a sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable. The Contractor shall not be responsible for damage or loss resulting solely from the acts or omissions of the Owner or the Engineer or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under the Indemnification clause in this Article 5.

5.26 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated by the Contractor in writing to the Owner and Engineer.

5.27 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs required in connection with the Work and shall send copies of all accident, injury or work-related illness reports and of all notices of unsafe conditions to the Engineer.

5.28 The Contractor shall not load or permit heavy weights to be placed on any part of the construction or site so as to endanger its safety.

### **Hazardous Materials**

5.29 If the Contractor encounters material on the site which it reasonably believes may contain asbestos, polychlorinated biphenyl (PCB) or other hazardous material, the Contractor shall stop work in the affected area and shall notify the Owner in writing. The Owner shall have the suspected material tested and if found to contain asbestos, PCB or other hazardous material, the Owner shall have the material removed or rendered harmless. Work in the affected area may be resumed when the Owner gives written notice that the material containing asbestos, PCB or other hazardous material has been removed or made harmless. If halting work in the affected area impacts the Contractor's critical path for construction, the delay will be regarded as an Excusable Delay and the Contract Time will be extended.

### **Owner's Indemnification for Hazardous Materials**

5.30 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Engineer, Design Engineer, and each of their consultants, agents, employees, officers, and shareholders from and against all claims, damages, losses and expenses, including, but not limited to, attorney's fees, arising out of or resulting from work in areas affected by asbestos, polychlorinated biphenyl (PCB) or other hazardous material, the presence and location of which has not been identified by the Owner in writing.

### **Emergencies**

5.31 In an emergency affecting safety of persons or property, the Contractor shall act as required to prevent threatened damage, injury or loss without instruction or authorization from the Owner or Engineer. Additional compensation or extension of time claimed by the

Contractor on account of such an emergency shall be determined as provided under Article 10.

### **Indemnification**

5.32 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Engineer and the Design Engineer and each of their agents, consultants, officers, employees, and shareholders from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, caused in whole or in part, or arising out of, connected with, or resulting from the performance of the Work, regardless of whether or not such liability, claim, damage, loss or expense was caused in part by any negligent act or omissions, whether active or passive, by a party indemnified hereunder. The Contractor stipulates that this provision has been negotiated in accordance with applicable law to be fully enforceable.

5.33 The obligation of the Contractor under this indemnity and hold harmless agreement shall not apply to liability for damages arising from the sole negligence or willful misconduct of the Owner, the Engineer, or the Design Engineer or their agents, consultants, employees, officers, shareholders or independent contractors (other than the Contractor).

5.34 The Contractor's liability to the Owner, Engineer and Design Engineer under this Indemnification Clause shall not be limited by any legal limitation on the amount or type of damages, compensation or benefits payable under workers' compensation acts, disability benefit acts or other employee benefit acts.

5.35 The Contractor's liability insurance shall provide coverage for the Contractor's obligations under this Indemnification Clause in accordance with paragraph 4.3.

## **Escrowed Bid Documents**

5.36 Contractor shall submit, within twenty-four (24) hours after award of the Contract, one copy of all documentary information generated in preparation of Bid prices for the Work and shall include all Subcontractor and Material Supplier estimates. This material is hereinafter referred to as “Escrowed Bid Documents” and shall be submitted in sealed containers and clearly marked “Escrowed Bid Documents.” The Escrowed Bid Documents of the successful Contractor will be held in escrow for the duration of the Contract.

5.36.1 The Escrowed Bid Documents are, and shall always remain, the property of the Contractor, subject to joint review by the Owner, Engineer Contractor and their agents, as provided for herein.

5.36.2 The Owner stipulates and expressly acknowledges that all or parts of the Escrowed Bid Documents, as defined herein, constitute trade secrets. This acknowledgement is based on the Owner’s express understanding that the information contained in the Escrowed Bid Documents may not be known outside Contractor’s business, may be known only to a limited extent and only by a limited number of employees of the Contractor, is safeguarded while in the Contractor’s possession, is extremely valuable to Contractors and could be extremely valuable to Contractor’s competitors by virtue of it reflecting Contractor’s techniques of construction. Owner further acknowledges that Contractor expended substantial sums of money in developing the information included in the Escrowed Bid Documents and further acknowledges that it would be difficult for a competitor to replicate the information contained therein. Owner further acknowledges that the Escrowed Bid Documents and the information contained therein are being provided to Owner only because it is an express prerequisite to award of the Contract. Owner further acknowledges that the Escrowed Bid Documents include a compilation of information used in Contractor’s business, intended to give Contractor an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation. Owner further agrees to safeguard the Escrowed Bid Documents against disclosure to the fullest extent permitted by law. In the event a third party requests disclosure of all or parts of the Escrowed Bid Documents, the Owner shall immediately notify the Contractor and cooperate with Contractor’s efforts to prohibit disclosure.

5.36.3 The Contractor agrees, acknowledges, represents and warrants that as a condition of award of the Contract, that the Escrowed Bid Documents constitute all the information used in the preparation of the Bid and that no other bid preparation information shall be considered in

resolving disputes or claims. The Contractor also agrees that nothing in the Escrowed Bid Documents shall change or modify the terms or conditions of the Contract Documents.

5.36.4 Purpose. The purpose of the “Escrowed Bid Documents” procedure can best be explained by defining what this program is intended to accomplish and what this program is not intended to accomplish.

5.36.5 To Be Accomplished.

.1 Create a spirit of cooperation in an atmosphere of honesty and candor between the Owner and the Contractor.

.2 Establish a base line of the Contractor’s accepted proposal.

.3 Provide an objective data bank to facilitate the determination and negotiation of changes/additions/deletions.

.4 Minimize Owner/Contractor disputes and streamline the resolution of these disputes.

.5 Creates risk sharing between the Owner and Contractor thereby eliminating contingency costs to the Owner for conditions which may never occur.

5.36.6 Not To Be Accomplished.

.1 Not to be used by the Owner to evaluate the Contractor’s anticipated construction methods and procedures.

.2 Not to be used to any extent to furnish information from the Contractor’s bid to any organization, company or individuals other than the Owner’s and Engineer’s staff and claims consultants associated with the Project.

.3 Not to be reproduced by the Owner except by mutual agreement.

.4 Not to create additional expense to the Contractor during bid preparation.

## **Content of Escrowed Bid Documents.**

5.37 Contractor may submit Escrowed Bid Documents in its usual estimating format; a standard format is not required. It is not the intention of this requirement to cause the Contractor extra work during the preparation of the bid but to ensure that the Escrowed Bid Documents will be adequate to, enable



complete understanding and proper interpretation for their intended use

5.37.1 It is required that the Escrowed Bid Documents clearly itemize the estimated costs of performing the Work as required to present a detailed cost estimate and allow a detailed cost review. Crews, equipment, takeoff quantities, and rates of production shall be detailed. Estimated costs shall be broken down into the Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and Subcontract costs as appropriate. Plant and equipment and indirect costs shall be detailed in the Proposer's usual format.

5.37.2 All costs shall be identified. For items amounting to less than \$10,000, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and Subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.

5.37.3 The Escrowed Bid Documents shall include all quantity takeoffs, calculations of rates of production and progress, copies of quotes from Subcontractors and Material Suppliers, and memoranda, narratives, add/deduct sheets and all other information used by the Contractor to arrive at the prices contained in the Bid.

5.37.4 The Escrowed Bid Documents shall be accompanied by the certification signed by a corporate officer authorized by the Contractor stating that the material in the Escrowed Bid Documents constitute all the documentary information used in preparation of the bid and that the Contractor has personally examined the contents of the Escrowed Bid Document container and has found that the documents in the container are complete.

#### **Initial Examination**

5.38 Escrowed Bid Documents of the Contractor will be examined, organized, and inventoried immediately upon receipt by a representative of the Owner and a representative of the Engineer.

5.38.1 This examination is to ensure that the Escrowed Bid Documents are legible and complete. It will not include review of and will not constitute approval of proposed construction methods, estimating assumptions, or interpretations of Contract Documents. Examination will not alter any condition or term of the Contract.

5.38.2 Should the examination and inventory by the Owner or Engineer indicate that data is incomplete or

missing, the representatives will describe such incomplete or missing data to the Contractor who shall supply it within twenty-four (24) hours.

5.38.3 If all the itemized cost breakdowns and allocations required previously mentioned herein have not been made, due to last minute bid revisions, the detailed breakdown of estimated costs shall be reconciled and revised by agreement between the Contractor and Owner before making the award.

#### **Subsequent Examinations**

5.39 The Escrowed Bid Documents may be examined at any time deemed necessary by both the Owner and the Engineer in order to determine the Contractor's bid concept and assumptions and to assist in the negotiation of price adjustments and Change Orders and the settlement of disputes and claims.

5.39.1 Examination of Escrowed Bid Documents is subject to the following conditions:

(a) The Escrowed Bid Documents are proprietary and confidential as to trade secrets contained therein.

(b) The Owner and the Contractor shall each designate in writing to the other party and within ten (10) calendar days after execution of the Contract, representatives who are authorized to examine the Escrowed Bid Documents. No other person shall have access to the Escrowed Bid Documents. The designated representatives may be amended from time to time by either party.

(c) Access to the Escrowed Bid Documents may take place only in the presence of duly designated representatives of both the Owner and Contractor.

(d) The Owner will take reasonable steps to protect the Escrowed Bid Documents from disclosure not permitted by this agreement.

#### **Conditions for Return to Contractor**

5.40 Upon completion of the Contract issuance of Final Payment by the Owner, verification that all litigation has been completed, and verification that future litigation does not exist, the Escrowed Bid Documents will be sealed and promptly returned to the Contractor by the party in charge of the Escrowed Bid Documents. Reproducing of any portion of the Escrowed Bid Documents will not be permitted at any time without written permission from the Contractor.

## **ARTICLE 6 - OWNER**

### **Owner's Right to Perform Work and Award Separate Contracts**

6.1 The Owner reserves the right to perform construction within, related to or adjacent to the Work as a separate activity using its own workers or by contracts with separate contractors under contract conditions similar to those in Article 4 with respect to insurance and subrogation. The Owner shall provide coordination of these separate activities with the Work of the Contractor.

6.2 The Contractor shall cooperate with the Owner's separate contractors and workers and shall afford them access to their work areas and space to store materials, tools and equipment. The Contractor shall adjust its construction schedule to reflect agreed upon interfaces with the Owner's separate activities.

### **Mutual Responsibility**

6.3 If part of the Contractor's work depends on or must interface with work performed by the Owner as a separate activity, the Contractor shall (1) cooperate with the Owner's coordination of the work efforts, (2) inspect work provided by the Owner's separate activities for compatibility with work provided or intended to be provided by the separate contractor, and (3) report to the Owner and the Engineer, prior to proceeding with work that may be affected, any deficiencies in work planned or executed by the Owner that would render it incompatible with work planned or completed by the separate contractor.

6.4 If the Contractor is caused delay or additional cost because of the Owner's separate activities, it may make a Claim as provided under Article 10.

### **Owner's Right to Stop the Work**

6.5 If the Contractor fails to correct defective work or continues to perform defective work, the Owner may issue a signed order directing the Contractor to stop the Work or a portion of the Work until the defective work has been corrected. This right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

### **Owner's Right to Carry Out The Work or Correct Defective Work During Construction**

6.6 If the Contractor fails to remove and replace or correct Defective Work, or if the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails to cure the defect, fault or

neglect within 7 days after receipt of written notice from the Owner, the Owner may issue a second notice warning the Contractor that if it does not correct the defect, fault or neglect within the second 7-day period the Owner will, without prejudice to other remedies the Owner may have, correct such deficiencies. In which case, the Owner will deduct the cost of correcting such deficiencies, including compensation for any additional engineering services required, from payments due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. The Owner's right to correct Defective Work during the Guarantee Period is covered in Article 12.

## **ARTICLE 7 - ADMINISTRATION OF THE CONTRACT**

7.1 At the Owner's option, either the Owner or the Engineer designated by the Owner will provide administration of the Contract and will be the Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the Guarantee Period. If an engineer other than the Design Engineer is appointed to be the Engineer to administer the Contract during construction, the duties and responsibilities of the Engineer and the Design Engineer during construction will be defined in the Supplementary Conditions, in Division One of the Specifications or in a modification to the Contract.

7.2 The Engineer may visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in accordance with the Contract Documents. However, the Engineer will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. The Contractor shall not rely upon the Engineer's site visits nor raise as a defense to any claims of defective work, that the Engineer visited the site or observed the site.

7.3 The Engineer shall not have control over or charge of and shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Article 5. The Engineer shall not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

7.4 The Engineer shall not have the authority to authorize extra work or to change the Contract Time or Price. The Engineer shall not have the authority to stop the Work. The Engineer's duties, responsibilities and limitations of authority are set forth in the Agreement between the Owner and the Engineer and shall not be modified by any action or inaction of any parties and can only be changed by a fully executed Amendment to the Agreement between the Owner and the Engineer.

7.5 The Engineer will have authority to reject Defective Work. The Engineer will have authority to require additional inspection or testing of the Work whether or not such Work is fabricated, installed or completed. Neither this authority of the Engineer nor a decision not to exercise such authority shall give rise to a duty or responsibility of the Engineer to the Contractor, subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

7.6 The Owner may arrange for the Engineer to provide a full-time on-site Resident Engineer with additional staff as appropriate. The duties, responsibilities and limitations of authority of the Resident Engineer and his staff shall be the same as defined for the Engineer in the Agreement between the Owner and the Engineer.

### **Communications**

7.7 Communications between the Owner or the Design Engineer and the Contractor shall be through the Engineer. Communications between the Contractor and the Design Engineer shall be through the Engineer, and communications between the Contractor and the Design Engineer's consultants shall be through the Engineer and the Design Engineer. Communications between the Engineer and the subcontractors shall be through the Contractor.

### **Requests for Information and Responses**

7.8 The Engineer will endeavor to issue Responses to Requests for Information within 30 days of the date a Request for Information is received by the Engineer unless the Engineer requests more information from the Contractor in which case the Response will be issued 20 days after receipt of the additional information. The Contractor shall use the Request for Information form, attached as Exhibit GC-1. The Engineer's Response to a Request for Information shall not authorize a change in Contract Time or Price. If the Contractor disagrees with the Engineer's interpretation of the Contract Documents, it shall notify the Engineer in writing in accordance with Article 9. The Engineer shall not be required to answer Requests for Information when the information is

contained in the Contract Documents or when the Request for Information form is incomplete or not used.

## **ARTICLE 8 - SUBMITTALS**

### **Definitions**

8.1 Definition of Terms:

.1 "Shop Drawings" are drawings, diagrams, schedules and other data custom prepared by the Contractor or one of its subcontractors or suppliers to illustrate some portion of the Work.

.2 "Product Data" are catalogue pages, brochures, schedules, performance charts, diagrams, instructions and other information which have been highlighted or marked and certified (if required in the Technical Specifications) by the Contractor to indicate the specific items, including options, that are being submitted for some portion of the work.

.3 "Submittal for Informational Purpose Only" is an item required for the Owner's permanent records relating, in part, to future maintenance, repair, modification, replacement of work or as otherwise required. Submittals for Informational Purpose Only will only be received and logged to document that the required submittals have been made. Neither the Owner nor Engineer will respond to a Submittal for Informational Purpose Only.

.4 A "Proposed Equivalent" is an item proposed for use by the Contractor in lieu of the first specified item and warranted by the Contractor as being at least equal in quality, utility, function and appearance to the first specified item. The Contractor shall assume all costs and be fully and solely responsible for the Proposed Equivalent.

.5 "Favorable Review" by the Engineer means that based on information submitted by the Contractor and in consideration of the Contractor's warranty required by General Conditions paragraph 8.8 the Contractor may provide the Favorably Reviewed item or work subject to the limitations in General Conditions Article 8, the General Requirements of Division 1, and the Engineer's review comments.

.6 The term "first specified item" or "first named maker" refers to the first product identified in the Specifications by a model number or trade name and/or by a maker's name for a specified item.

### **Specified Items, Proposed Equivalents ("Or Equal")**

8.2 When the first specified item is followed by a second maker's name and "or equal," the Contractor may submit Proposed Equivalent items for the Engineer's review. Proposed Equivalent items that are in the Engineer's judgment equal to the first specified

item in quality, utility, and appearance, will be Favorably Reviewed. Where a product description and first maker's name is followed by "or equal" with no second maker's name, it means the specifier knows of no equivalent product and the Contractor may submit Proposed Equivalent products by other makers for review. Where the term "or equal" is omitted, it means that the named item is required to meet the Owner's needs; no products or makers other than those specified will be considered.

8.3 Proposed Equivalent items must be submitted as required for Product Data submittals on the form attached as Exhibit GC-3 and shall include adequate technical information to fully describe the function and quality of the item. Submittals of Proposed Equivalent items that are not made within 35 days of the Notice to Proceed will be rejected unless the Engineer has agreed in writing to a later submittal date and the Contractor agrees to comply with all conditions of the Engineer for the late submittal. If the Contractor's second attempt to obtain Favorable Review of a Proposed Equivalent item is unsuccessful, the Contractor shall submit the first specified item.

8.4 Inclusion of a second maker's name indicates the maker is acceptable but does not necessarily indicate the maker offers a standard product equal to the first specified item.

.1 Items by the second named maker are subject to the same conditions of review and compatibility as other Proposed Equivalent items.

.2 Inclusion of a maker's name and/or model number after a specification description is not a representation that the maker will furnish an item meeting the Contract requirements at bid time or at time of need. It is the Contractor's sole responsibility to furnish items meeting the Contract requirements.

8.5 Where items are specified with a description followed by a maker's name and trade name or model number, the item shall be provided with all of the custom modifications, special features, accessories and options described even though such things may not normally be included by the maker or provider as part of the model specified. Where there is a conflict between the written description of an item and maker's trade name and/or model number, the written description shall take precedence.

8.6 The design is based on first specified items including all described custom modifications, special features, accessories and options as made by the first named maker. The Contractor shall be responsible for all cost including redesign required to accommodate a Proposed Equivalent item including items by the second named maker.

8.7 The Engineer's review of Proposed Equivalent items is based solely on information provided by the Contractor and on the Contractor's warranty that the proposed item is at least equal in quality, utility, function and appearance to the first specified item. Favorable Review of a Proposed Equivalent item has the same meaning and is subject to the same limitations that apply to the Favorable Review of Product Data and Shop Drawings described in this Article.

### **Shop Drawings, Product Data, Samples and Proposed Equivalents**

#### **Intent of Contractor's Review**

8.8 The Contractor shall make required submittals including Shop Drawings, Product Data, Samples and Proposed Equivalent items in time to allow for the Engineer's review and resubmittal, if required, without causing delay to the Work. The Contractor and appropriate subcontractor shall review, stamp, date and sign submittals before sending them to the Engineer. By making such a submittal, the Contractor makes the following warranty and shall include that warranty statement on its letter of transmittal.

"The Contractor warrants:

1. Work or items submitted are complete, accurate and meet the requirements of the Contract Documents, or else any deviations are identified and described in a separate letter accompanying the submittal form, Exhibit GC-2.
2. Work or items submitted have been coordinated with and meet the requirements of other submittals, field conditions and the Work as a whole and quantities and dimensions are correct.
3. Proposed Equivalent items are at least equal in quality, utility and appearance to the first specified item, or else any deviations are identified in a separate letter accompanying the submittal form, Exhibit GC-3.
4. Adjustments to other work required to accommodate Proposed Equivalent items including second named items have been delineated on the submittal and will be made at the Contractor's expense.
5. This submittal includes all items needed for a particular specification section or assembly for which submittals are required.
6. And represents that all material, equipment, hardware, software and firmware product provided to the Project will perform without error, loss of data or loss of functionality arising from any failure to process, calculate, compare or sequence data accurately.

## **Intent and Limitations on Engineer's Review**

8.9 The Engineer's review of the Contractor's submittals is done solely for the Engineer's and Owner's benefit. The Contractor agrees that the Engineer has no duty to the Contractor or any of its subcontractors or suppliers for the accuracy, completeness or adequacy of the Engineer's review of its submittals.

8.10 The Engineer's review of submittals is for compliance with the design intent and requirements of the Contract Documents and is based solely on information provided by the Contractor and on the Contractor's warranty that the work or items submitted meet the requirements of the Contract Documents, and the Work as a whole. If later information reveals that work or items submitted or furnished do not meet the requirements of the Contract Documents or the Work as a whole, the Engineer's Favorable Review shall be void and the items or work shall be considered Defective. The Engineer's Favorable Review shall not include an examination of methods or means of construction or required safety precautions. The Engineer's Favorable Review: (1) shall not include a review of quantities or dimensions, (2) shall not relieve the Contractor from responsibility for errors or omissions in submittals, (3) shall not relieve the Contractor from responsibility for complying with the requirements of the Contract Documents, (4) shall not constitute a Change Order, and (5) shall not constitute final acceptance of a product, item or portion of the Work.

8.11 The Engineer's Favorable Review of submittals shall not relieve the Contractor from responsibility for deviations from the requirements of the Contract Documents unless the deviations are specifically called to the Engineer's attention in a separate letter accompanying the submittal form, Exhibit GC-2, and the Engineer favorably reviews the specific deviations in writing.

8.12 The Engineer's Favorable Review of a re-submittal does not include a review of changes made by the Contractor to a previous submittal that were not requested by the Engineer unless the Contractor specifically calls the Engineer's attention to the non-requested changes, in a separate letter accompanying the resubmittal of form Exhibit GC-2.

8.13 Where performance type specifications are used or where pre-engineered or Contractor designed systems, elements, equipment or components are called for, the Owner, the Design Engineer and the Engineer shall have the right to rely on the Contractor's design. Favorable Review of the Contractor's design submittal shall be limited to acknowledgment that the design was prepared with the intent of meeting the specified performance

criteria, but the Engineer's review shall not constitute a review of the design itself, of the designer's calculations, or of the effectiveness of the design in actually satisfying the specified criteria.

8.14 The Contractor shall allow 30 days for the Engineer's review of each submittal and 30 days for each resubmittal unless a different period is specified by the Engineer in writing. If the Engineer requests additional information or clarification of a submittal, the 30 days shall be measured from the date the additional information or clarification is received. If the Contractor requires more than two submittals to obtain the Engineer's Favorable Review, the Contractor shall compensate the Owner for the cost of the Engineer's additional review time. The Contractor shall not perform work for which reviewed submittals are required without obtaining Favorable Review of submittals.

8.15 Submittals required for the Owner's or Engineer's information and on which the Engineer shall not be expected to take responsive action are identified in the Contract Documents.

## **ARTICLE 9 - CHANGES IN THE WORK**

### **Changes**

9.1 The Owner may order changes in the Work after executing the Agreement by issuing a written Change Order or Work Directive Change.

9.2 The Contractor expressly agrees that it shall not consider any order, instruction, Clarification, Response to a Request for Information or any other communication either written or oral given intentionally or unintentionally by the Engineer, Owner or any other person as authorization or direction to do work that would cause a change in Contract Time or Price unless it is a Change Order or Work Directive Change signed by the Owner.

### **Requests for Quotation**

9.3 If a change involving Contract Price or Time is being considered, the Engineer will issue a Request for Quotation describing the proposed change. The Contractor shall submit a quotation promptly so not to delay or interfere with the progress of the Work, in accordance with the requirements for determining the cost of changes described in this Article.

## **Change Orders**

9.4 If the Owner and the Contractor agree on the change in Price and Time for a proposed change, a Change Order will be issued and signed by the Engineer, Contractor and the Owner. An executed Change Order shall be conclusive and final settlement of the change in Contract Time and Price for the work covered by the Change Order including the effect of the change on all other portions of the work completed or not and shall include compensation for all related claims for disruption, impact, delay or extended overhead, if any, that may result from the change. Implied in every Change Order, unless expressly reserved by the Owner or Contractor, is a waiver of all known and unknown claims arising out of the Change Order, including a waiver of Section 1542 of the California Civil Code as well as under any other state or federal statute or common law principle of similar effect which provides as follows:

"GENERAL RELEASE CLAIMS EXTINGUISHED.

A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which, if known by him, must have materially affected his settlement with the debtor."

9.5 The Owner reserves the right to have changed work performed by a separate contractor or its own workers if the Contractor and the Owner cannot agree on the change in Price and Time required.

## **Work Directive Change**

9.6 If the Owner and the Contractor have not agreed on the change in Price or Time required for a proposed change, or if time does not permit preparation of a quotation, the Owner may direct the Contractor to proceed with the work on a cost accounting basis by issuing a Work Directive Change.

9.7 All Work Directive Changes must be signed by the Owner and will state the maximum sum the Owner is obligated to pay.

.1 If the Contractor has agreed to do the work on a cost accounting basis and to complete the work for an amount not to exceed the stated maximum sum, the Contractor shall sign the Work Directive Change.

.2 If the Contractor cannot agree to a maximum sum to complete the work, the Contractor shall not sign the Work Directive Change. In that case the maximum sum shall limit the amount the Owner is obligated to pay to the Contractor but shall not obligate the Contractor to complete the work for that sum.

9.8 When the Owner and the Contractor agree on the change in Price and Time for a Work Directive Change, the Work Directive Change shall be converted into a Change Order.

## **Information, Interpretations and Minor Changes**

9.9 The Engineer has the authority to order minor changes in the Work including interpretations which are consistent with the intent of the Contract Documents. The Engineer does not have authority to order any changes which involve:

- .1 a change in Contract Price, or
- .2 a change in the Contract Time, or
- .3 means, methods, techniques or sequence of Work, or
- .4 safety in, on or about the site.

If the Contractor considers that any minor changes so ordered causes a change in Contract Price or Time, the Contractor shall notify the Engineer in writing within 15 days of receipt of the order and shall not proceed with the work except in the case of an emergency endangering persons or property.

9.10 If, after reviewing the Contractor's objection to a minor change, the Engineer determines the work is required by the Contract Documents and does not involve a change in Price or Time, the Owner may direct the Contractor, in writing, to proceed with the work. If so directed, the Contractor may (1) accept the Engineer's determination and proceed with the work or (2) give the Engineer written notice 5 days in advance of beginning work stating that it intends to make a claim under Article 10 and will document costs in accordance with paragraphs 9.11 through 9.14.

## **Determining Cost of Changes**

9.11 The Contractor's quotations of cost on proposed changes and cost reported for work performed on a cost accounting basis shall be determined as the sum of the following:

.1 costs of labor including foremen engaged on the work but not of the Superintendent, field engineer, project manager, and other supervisory or support personnel except as provided in paragraph 9.11.5. Labor costs shall include the cost of social security, old age and unemployment insurance, fringe benefits required by labor agreements and workers' or workmen's compensation insurance;

.2 costs of materials, supplies and equipment, including cost of transportation, incorporated in the Work;

.3 rental costs of machinery and equipment, exclusive of portable power or hand tools, supplied by the Contractor or rented from others;

.4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the change;

.5 the increased or decreased cost of the Contractor's supervision and field office personnel but only if the change affects the "critical path" of construction activities and requires a change in Contract Time;

.6 the reasonable cost of any tier of subcontractors' work computed as required for the Contractor's work. The mark-up charged by a subcontractor for overhead and profit shall be the lesser of: i) subject to negotiation, ii) as included in the original bid for the Work, or iii) not to exceed 10% for work performed directly by the subcontractor and 5% for work performed by a subcontractor one tier below it, and

.7 for the reasonable work performed by the Contractor, the mark-up for overhead, profit and all other costs shall be the lesser of: i) subject to negotiation, as included in the original bid for the Work and contained in escrowed bid documents, or iii) not to exceed 10% for work performed directly by the Contractor and 5% for work performed by a subcontractor.

.8 Limitations on Markup for Changes. Where multiple tiers of Subcontractors are involved in a change in the Work, the maximum total amount of adjustment to the Contract Price and for markup for all tiers of Subcontractors and for Contractor self-performed Work shall not exceed twenty percent (20%) of the direct costs incurred by Contractor and the Subcontractors and Material Suppliers actually performing the Work.

Work shall be done making the most effective use of labor; materials shall be purchased at the lowest available price and all discounts shall be passed on to the Owner; equipment shall be rented at the most favorable rate available for the term of use required.

9.12 When both additions and deletions are related and pertain to the same work item and are included in the same Change Order, the mark-up for overhead and profit shall be computed on the net increase, if any. No deductions for overhead and profit will be made on deductive changes except for deductive changes that materially change the scope of the work or deductive changes issued pursuant to the Owner's right to correct defective work, the Owner's right to remedy the Contractor's default or neglect or the Owner's right to terminate the Contract for cause.

9.13 The Contractor shall keep the Engineer informed as to when and where work is being performed on a cost

accounting basis and shall submit complete auditable records of the cost of such work including daily time sheets signed daily by the Engineer.

9.13.1 Contractor Maintenance of Daily Records for Changes. In the event that Contractor is directed to perform any changes to the Work, or should Contractor encounter conditions which the Contractor believes would obligate the Owner to adjust the Contract Price and/or the Contract Time, Contractor shall maintain detailed records of the cost of such changes on a daily basis and a summary in a daily report supplemented by back-up records. Such records shall include without limitation hourly records for labor and construction equipment, itemized records of materials, including delivery tickets, and equipment used each day in connection with the performance of any change to the Work. In the event that more than one change to the Work is performed by Contractor in a calendar day, Contractor shall maintain separate records of labor, construction equipment, materials, and equipment for each such change. In the event that any Subcontractor of any tier shall provide or perform any portion of any change to the Work, Contractor shall require that each such Subcontractor maintain records in accordance with this Article. Each daily record maintained hereunder shall be signed by the Contractor; such signature shall be deemed Contractor's representation and warranty that all information contained therein is true, accurate, complete, and relates only to the change referenced therein. All records maintained by Subcontractors of any tier, relating to the costs of a change in the Work shall be signed by such Subcontractor's authorized Project Manager or Superintendent as a representation and warranty that all information contained therein is true, accurate, complete, and relates only to the change referenced therein. All such records shall be delivered to Engineer not later than on the day the Work is performed (same day) for independent verification. The Engineer shall attempt to review and reconcile costs of changes on a daily basis. The Engineer's signature on the report shall indicate agreement with the information reflected therein, not that the Contractor is entitled to payment of the costs in the report. If the Engineer disagrees with the response, the Engineer shall note the areas of disagreement on the report. In the event that the Contractor shall fail or refuse, for any reason, to maintain or make available for inspection, review and/or reproduction such records, adjustments to the Contract Price or Contract Time, if any, on account of any change to the Work may be deemed waived for that day. Contractor's obligation to maintain back-up records hereunder is a material inducement to and in addition to, and not in lieu of, any other Contractor obligation under the Contract Documents with respect to changes to the Work.

9.13.2 Labor. The daily report shall show the names, trade, labor, classifications, and hours worked, for the workers.

9.13.3 Material. The daily report shall describe and list quantities of materials used, attaching delivery tickets.

9.13.4 Equipment. The daily report shall show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable.

9.13.5 Other Services and Expenditures. Other services and expenditures shall be described in such detail in the daily report as the Owner or Engineer may require.

9.13.6 Cost. The report shall provide dollar values for each category of cost.

9.14 Any work for which the Contractor may wish to make a claim shall be done in accordance with these requirements for work done on a cost accounting basis.

### **Change in Contract Time Due to Changes in the Work**

9.15 If the work required by a Change Order affects the "Critical Path" of construction tasks and is the sole, unavoidable cause for changing the length of time required to complete the Work, the Contract Time will be adjusted accordingly.

## **ARTICLE 10 - CLAIMS AND DISPUTES**

### **Claims**

10.1 A Claim is a written demand by one of the parties to the Contract for an interpretation of Contract terms or an adjustment in Contract conditions including Price or Time and may involve questions of performance under the Contract including acceptability of work, progress of work, the extent to which work has been completed, whether work is included in the Contract, and other matters in question between the Owner and the Contractor.

10.2 Content of Claim. Claims shall be made in writing and shall include complete documentation including:

.1 The Contractor's certification, by its owner or an officer, under penalty of perjury, that (a) the claim is made in good faith, (b) supporting data are accurate and complete to the best of the Contractor's and subcontractor's knowledge and belief, and (c) the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable.

.2 Full disclosure of facts and detailed reasons supporting the Claim and citing relevant provisions in the Contract Documents.

.3 Complete documented cost of doing the work for which it is making a Claim and such cost and documentation shall be submitted in accordance with General Conditions paragraphs 9.11 through 9.14.

### **Engineer's Decisions**

10.3 The Engineer, as an arbiter of disputes, will make an initial decision on all Claims made prior to the date the final payment is due including Claims alleging an error or omission by the Engineer. The Engineer's decision will be in writing, will be consistent with the intent of the Contract Documents and will cite the basis on which it is made. The Engineer will endeavor to make decisions that are impartial and will not be liable for results of decisions made in good faith. The Engineer's decision is a condition precedent to a demand by either party that a Claim be settled by litigation, or if agreed to in advance by both parties or if required by law, be settled by mediation or arbitration.

### **Time Limits for Submitting and Deciding Claims**

10.4 The Contractor shall give written notice 5 days prior to beginning any work for which it intends to make a Claim for an increase in Contract Time or Price and expressly waives any right to make a Claim if the required notice is not given. All other Claims must be made within 14 days of the time the condition giving rise to the Claim becomes known to the claimant. The Engineer, as an arbiter of disputes, will issue a written decision on the Claim within 30 days after receipt of the Claim unless additional information is requested from the claimant or the claimant amends the Claim and then a decision will be issued within 30 days after receipt of additional information, or an amended Claim.

Should a Claim be presented that is in part timely and in part untimely, the Engineer shall reject the untimely Claim and decide the timely claim. All Claims must strictly follow the notice requirements of this agreement.

10.5 A demand to appeal the Engineer's decision and settle a Claim by litigation, mediation or arbitration can only be made after the Engineer has made a written determination, or in the absence of a determination, 7 days after the Engineer's determination became due. If no demand to settle a Claim by litigation, mediation or arbitration is made within 15 days after the Engineer's written decision was issued, the Engineer's decision shall become final and binding on the Owner and the Contractor and if a change in Contract Time or Price is involved, a Change Order shall be signed by both parties.



10.6 Provisions of law notwithstanding, the Owner and Contractor hereby agree that neither the Engineer, the Design Engineer, nor any other third party shall, without its specific written consent, be required to participate as a party in any litigation, arbitration or mediation proceedings between the Contractor and the Owner initiated to resolve disputes under the Contract Documents.

### **Mediation**

10.7 If any dispute, controversy, or Claim (hereinafter referred to as a dispute) arises out of or relates to this Contract, or breach thereof, and if the dispute cannot be settled through direct discussions, then the parties first agree to try to settle the dispute by mediation before resorting to litigation or some other dispute resolution procedure. The mediator shall be an attorney experienced in mediating construction disputes and shall be chosen by agreement of the parties, but if no agreement then appointed by the Presiding Judge of the Superior Court in the jurisdiction of the site. Each party shall bear its own costs and expenses of the mediation, including attorney's fees. The fees and costs of the mediator shall be borne equally by the parties.

### **Work Continued During Disputes**

10.8 The Contractor shall continue to work in conformance with the requirements of the Contract Documents and the progress schedule during any dispute and when waiting for decisions on Claims by the Engineer or for resolution of Claims by litigation, mediation or arbitration, unless otherwise directed in writing by the Engineer or Owner.

## **ARTICLE 11 - CONTRACT TIME AND DELAYS**

### **Definitions**

11.1 Definitions of Terms:

1 "Contract Time" is the period of time including authorized adjustments allowed for completion of the Work and is measured from the date of commencement in the Notice to Proceed to the date of Final Completion.

.2 "Day" is a calendar day beginning and ending at midnight.

.3 "Unusual Weather" is defined as when either the number of Wet Days or the number of Freezing Days exceeds the most recent published mean number of Wet or Freezing Days for the period of record, for the same month and for the weather observing station closest to the project site as reported in "Comparative Climatic Data" published by the National Oceanic and Atmospheric Administration, Ashville, NC 28801. "Wet Days" are defined as days that have at least 0.01 inch of rainfall

unless modified in the Supplementary Conditions. "Freezing Days" are defined as days with a minimum temperature of 32 degrees F or lower.

### **Computation of Time**

11.2 Any period of time referred to in the Contract Documents measured in days shall mean consecutive calendar days and shall exclude the first and include the last day. If the last day falls on a Saturday, Sunday or legal holiday, it shall be omitted from the calculation.

### **Contract Time**

11.3 Time limits stated in the Agreement are the essence of the Contract. The Contractor confirms that the Contract Time is a reasonable period for performing the Work and includes enough float time to allow for normal unfavorable weather and other reasonably anticipated delays.

### **Damages for Late Completion**

11.4 Liquidated damages if applicable are stipulated in the Agreement. If liquidated damages are not stipulated, the Contractor will be assessed actual damages suffered by the Owner as a result of completion after the Contract Time.

### **Commencing Work**

11.5 The Contractor shall not commence work (1) prior to the date in the Notice to Proceed, (2) prior to giving the Engineer 5 days written notice and (3) prior to the effective date of insurance coverage required under Article 4.

### **Accelerated Work If Required to Meet Schedule**

11.6 The Contractor shall proceed expeditiously with adequate forces and shall achieve Final Completion within the Contract Time. If the Contractor's performance falls behind schedule, the Contractor shall accelerate the work as required to get back on schedule at no additional cost to the Owner. Accelerated work shall include air or express delivery of materials and equipment, increasing the number of workers, working overtime, working Saturdays, Sundays, and holidays and working additional shifts. The Contractor shall pay the Owner for any extra cost of inspection made necessary by accelerated work required under this provision.

### **Excusable Noncompensable Delay**

11.7 "Excusable Delay" means unforeseeable delay beyond the Contractor's or Owner's control and not

resulting from the Contractor's fault or negligence. Excusable Delay includes labor disputes, fire, Unusual Weather, unavoidable casualties and unusual delays in transportation. The Contractor may make a Claim under Article 10 for an extension of Contract Time due to an Excusable Delay if it can show that the Excusable Delay is the sole and unavoidable cause increasing the time actually needed to complete the Work. The Contractor shall not be entitled to an increase in Contract Price due to an Excusable Delay.

### **Compensable Delays**

11.8 The Contractor may make a Claim under Article 10 for extension of Contract Time due to delays that are not due to the fault or neglect of the Contractor and which could not have been reasonably anticipated, including delays: (1) caused by the Owner or Engineer or by the Owner's separate contractors or workers, (2) resulting from the Owner's failure to provide access to lands or rights-of-way on which the Work is to be performed, or (3) due to suspension of the Work ordered by the Owner. In making such a Claim, the Contractor must demonstrate that the delay was the sole and unavoidable cause for increasing the length of time required to complete the Work on the critical path. In the case of a delay which was caused in part by the Contractor and in part by the Owner (Concurrent Delay), Contractor shall only be entitled to an extension of the Contract Time or Milestone(s) and Contractor shall not be liable for Liquidated Damages during the period of Concurrent Delay, but Contractor shall not be entitled to any additional compensation whatsoever during the period of Concurrent Delay. For purposes of settlement of Claims under this paragraph, the Contractor's cost shall be determined in accordance with paragraph 9.11 except that no mark-up for profit will be allowed and therefore, the maximum percentage mark-ups allowed under subparagraphs 9.11.6 and 9.11.7 shall be reduced by one-third.

11.9 Changes in Contract Time associated with changes ordered by the Owner are covered under Article 9.

11.10 An executed Change Order covering changes ordered by the Owner under Article 9 or the resolution of Claims made under Article 10 shall be the final and conclusive settlement of the change in Contract Time and Price for the work or Claim covered by the Change Order including all related costs in accordance with Article 9.4.

10.11 Early Completion Delay Damages. While the Contractor may schedule completion of all the Work, or portions thereof, earlier than the Contract Time established in the Agreement, the Owner and Engineer

are exempt from liability for and the Contractor shall not be entitled to an adjustment of the Contract Price or to any additional costs, damages, or compensation whatsoever, for use of Float or for Contractor's inability to complete the Work earlier than the Contract Time established in the Agreement, for any reason whatsoever, including but not limited to, delay caused by Owner, Engineer or other compensable delay.

## **ARTICLE 12 - INSPECTION, DEFECTIVE WORK, GUARANTEE**

### **Defective Work**

12.1 Defective Work is work that (1) is unsatisfactory, faulty, deficient, or leaks, breaks, fails or does not conform to the Contract Documents; or (2) does not meet the requirements of reference standards, tests or approvals specifically referred to in the Contract Documents; or (3) has been damaged prior to final acceptance; or (4) does not meet applicable industry or trade standards; or (5) a submittal is required and Favorable Review has not been obtained.

### **Access to Work and Notice**

12.2 The Contractor shall provide the Owner, the Engineer and each of their representatives safe access to every part of the Work at all times work is in progress for observation, inspecting and testing. The Contractor shall give 2 days notice of work being ready for required inspection, test or approval or of intent to cover work up.

### **Tests and Inspections**

12.3 Unless otherwise specified, the Contractor shall arrange and pay for tests, inspections and approvals required by laws, ordinances, rules, regulations, orders of public authorities having jurisdiction or by the Contract Documents. All such tests, inspections and approvals shall be performed by an independent testing laboratory or inspection agency acceptable to the Engineer or to the appropriate public authority. Samples to be tested and items of work to be inspected will be selected by the Engineer or the public authority requiring the test or inspection. Test reports, inspection reports and certificates shall be submitted directly to the Engineer by the performing laboratory or agency. The Contractor shall notify the Engineer at least 2 days prior to all tests and inspections to permit observation by the Engineer.

### **Reinspection**

12.4 If the Engineer determines that portions of the Work require additional testing or retesting, the

Contractor shall provide material to be tested, safe access to test locations, power, light and other services. The cost of retesting shall be paid for by the Owner, but if the additional tests or retesting indicate that said portion of the Work is Defective, the Contractor shall pay the Owner all costs associated with additional testing or retesting including the cost of the Engineer's additional service.

### **Uncovering Work**

12.5 If work is covered or concealed without giving the Engineer 2 days notice to permit observation, it shall be uncovered or exposed at the Contractor's expense to permit observation if so requested.

12.6 If the Engineer wishes to have work uncovered for observation after having been given the required notice to observe it, the Contractor shall uncover the work on a cost accounting basis. If the work is found to be in accordance with the Contract Documents, the Owner shall pay the cost of uncovering and replacing the work. If the work is found to be Defective, the Contractor shall pay the cost of uncovering and correcting the work and the cost of required additional engineering and testing service.

### **Correction of Defective Work**

12.7 The Contractor shall promptly correct or replace: (1) work rejected by the Engineer as being Defective, and (2) work that is Defective whether or not rejected by the Engineer. The Contractor shall correct Defective Work prior to installing subsequent related or connected Work. The Contractor's obligation to correct Defective Work applies to latent as well as patent defects and whether or not the work is fabricated, installed or completed and whether observed before or after Substantial Completion. The Contractor shall bear the cost of correcting Defective Work including consequential costs, engineering services and attorneys' fees made necessary thereby.

### **Acceptance or Use of Defective Work**

12.8 The Owner may elect to accept Defective Work in which case a deductive Change Order shall be signed by the Contractor reflecting the decreased value of the Work. If final payment has been made, the Contractor shall pay to the Owner a sum reflecting the decreased value of the Work.

12.9 The Owner may use Defective Work without negating its rejection or decreasing the Guarantee Period which shall commence when the work is finally corrected or replaced and accepted. When all or part of the Work is being used by the Owner, the Contractor shall schedule

correction or replacement of Defective Work at the Owner's convenience.

### **Tests and Inspections Do Not Reduce Contractor's Responsibility for Performance**

12.10 Observations by the Engineer or tests, inspections or approvals by others shall not relieve the Contractor from its obligation to perform the Work in accordance with the Contract Documents.

### **Guarantee Period**

12.11 Within 7 days of receipt of written notice from the Owner, the Contractor shall correct or replace work found Defective within one year after the date of Final Completion of the Work and Acceptance by the Owner or such longer period as covered by any Special Guarantee required by the Contract Documents or by law. For work first performed or first made acceptable after the date of Final Completion, the one-year or longer Guarantee Period shall commence to run at the time the Work is completed or made acceptable.

### **Owner's Right to Correct Defective Work During Guarantee Period**

12.12 If the Contractor fails to correct Defective Work within 7 days of receiving notice to do so, the Owner may correct the Work and recover the cost of correction from the Contractor. If the Defective Work creates an emergency where delay would cause unsafe conditions or serious risk of loss or damage, the Owner may proceed to correct the Defective Work without giving the Contractor notice.

12.13 If the Owner corrects Defective Work under this paragraph, the Contractor shall pay the Owner all direct, indirect and consequential cost and all required engineering services and attorney's fees.

12.14 The Contractor shall be responsible for the cost of removing and replacing work provided by the Owner when such removal and/or replacement is necessary to permit correction of Defective Work for which the Contractor is responsible.

### **Contractor's Liability for Defective Work Not Limited by Guarantee**

12.15 Nothing contained in this Article 12 nor in any Special Guarantee required under Division 1 General Requirements shall be construed to limit the period of the Contractor's obligations under the Contract Documents or under law. Establishment of a time period for the Contractor's specific obligation to correct work places no limit on the time within which the

Contractor's obligation to comply with the Contract Documents may be enforced nor on the period during which the Contractor may be held liable for the effect of Defective Work.

12.16 Nothing contained in this Article 12 nor in any Special Guarantee required under Division 1 General Requirements shall be construed to limit the Contractor's, subcontractor's, material or equipment supplier's liability for damages sustained as a result of latent or patent defects in equipment or materials furnished or caused by the negligence of the Contractor or his subcontractors or suppliers. The guarantees contained in this Article 12 shall not be a waiver of nor shall they reduce any guarantee or warranty offered by the suppliers of materials or equipment furnished under this Contract nor shall they reduce any responsibilities imposed on manufacturers or suppliers of such equipment under law.

## **ARTICLE 13 - PAYMENT AND COMPLETION**

### **Schedule of Values**

13.1 At least 20 days prior to the first Application for Payment Date, the Contractor shall submit a Schedule of Values, in a form acceptable to the Engineer, allocating the Contract Price to various trades, types of work, pieces of equipment, and major tasks to assist the Engineer in evaluating the percentage completion for each part of the Work. The Contractor's overhead and profit shall be uniformly pro-rated over all items in the Schedule of Values. The Schedule of Values shall represent the actual cost of each segment of the work and shall not allocate higher costs, overhead or profit to work items scheduled for early completion. If the Engineer objects to the allocation of cost or the level of detail provided, the Contractor shall revise and resubmit the Schedule of Values.

### **Application for Payment**

13.2 The period covered by each Application for Payment shall be one calendar month. Payment shall be based on work completed as of the Application for Payment Date which shall be the last day of the month unless otherwise stated in the Agreement. Within 7 days after each Application for Payment Date, the Contractor shall meet with the Engineer to review the line item amounts proposed by the Contractor for payment. When the amounts proposed are acceptable to the Engineer, the Contractor shall prepare and submit within 3 days, the Application for Payment form, attached as Exhibit GC-4, and Conditional Lien Releases from the Contractor, each subcontractor, supplier and materialman whose work is included in the Application. The Contractor shall sign and certify on the Application for Payment, subject to

penalty of perjury, the following: "The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents and that all Work for which previous payments have been received is free and clear of liens, claims, security interests or encumbrances of any kind. The Contractor further warrants that title to all Work covered by this Application for Payment will pass to the Owner no later than the time of payment."

13.2.1 Taxes. The Contractor shall pay all applicable sales, consumer, use, and similar taxes for the Work provided by the Contractor and such taxes shall be included in the Contract Price.

13.2.2 Liability for Employee Payments. Contractor accepts full liability for the payment of any and all contributions, deductions, or taxes for social security, unemployment insurance, old age and survivor's benefits, medical and health benefits, or for any other purpose now or hereafter imposed under any applicable law measured by the wages, salary or other remuneration paid to persons employed by or on behalf of Contractor for the Work. Contractor covenants and agrees to observe and fully comply with all applicable law, including procurement of any necessary occupational licenses, permits and inspection certificates.

### **Payment for Items Delivered But Not Installed**

13.3 If recommended by the Engineer, Applications for Payment may include the percentage of value stipulated in the Agreement for major equipment and custom fabricated items that have been delivered, stored and protected at the site providing proof is furnished that title will pass to the Owner upon payment. Payment will not be made for material stored at the site that is not custom fabricated. Payment will not be made for items stored off the site. Payment will not be made for stored or installed items that are not protected from physical, environmental or other damage. Payment for successful submittal of Shop Drawings or Product Data will be made only when specifically provided for in Division 1.

### **Engineer's Recommendation for Payment**

13.4 Within 7 days after receipt of the Contractor's Application for Payment, the Engineer will either issue a Recommendation for Payment for such amount as the Engineer determines is due or will notify the Contractor and the Owner of reasons for withholding recommendation. The Engineer's recommendation will

not be an evaluation or interpretation based upon legal theories or principles but will be based upon sound engineering judgment. The Owner will seek independent legal services, if necessary to assist it in determining if withholdings are appropriate. Retainage to be withheld by the Owner is stipulated in the Agreement.

13.5 The Engineer's Recommendation for Payment will constitute a representation that to the Engineer's best knowledge, information and belief the Work has progressed to the point indicated and is generally in conformance with the Contract Documents but is subject to re-evaluation during subsequent site visits and upon final completion. The Engineer's Recommendation for Payment shall not be taken as a representation that the Engineer has (1) made exhaustive or continuous onsite inspections to check the quality of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Price, or (5) offered its legal opinion in any respect.

13.6 If, in the Engineer's opinion, the representations in paragraph 13.5 cannot be made or if the Engineer has knowledge of any of the faults listed below, then the Engineer may decline to issue a Recommendation for Payment or may recommend a reduced amount of payment or may rescind previously issued Recommendation for Payment. Faults for which payment may be withheld, reduced or rescinded include:

- .1 Defective Work not corrected;
- .2 Third party claims filed or reasonable evidence indicating probable filing of such claims;
- .3 Failure of the Contractor to make payments properly to subcontractors or suppliers for labor, materials or equipment;
- .4 Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;
- .5 Damage to property, the Work, the Owner, another contractor or a third party;
- .6 Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 Work performed for which submittals are required prior to obtaining Favorable Review of submittals;
- .8 Persistent failure to carry out the Work in accordance with the Contract Documents;

.9 Failure to submit a construction schedule or to update the construction schedule in accordance with General Conditions paragraph 5.18;

.10 Failure to update Record Drawings weekly;

.11 Failure to reinstate required insurance that has been allowed to lapse; or

.12 Non-payment of money owed to the Owner for the extra cost of inspection or engineering services provided for in the General Conditions.

## **Completion and Acceptance**

### 13.7 Definitions

.1 "Substantial Completion" means the Work has progressed to the point that: (1) the Work is ready for beneficial use and occupancy by the Owner for the intended purpose, (2) all fire and life safety work has been completed, inspected and accepted, (3) all mechanical and process systems and equipment are complete and have been put in automatic operation, (4) the total value of uncompleted work is less than one-half of one percent of the Contract Price and (5) completing the Work will not significantly interfere with the Owner's convenience, use or cost of operation.

.2 "Semi-Final Inspection" determines if the Work is Substantially Complete.

.3 "Final Inspection" determines if the Work has reached Final Completion.

.4 "Final Completion" indicates that the Work has been fully completed in accordance with the Contract Documents and is ready for acceptance and final payment by the Owner.

.5 "The Final Punch List" contains items that remain uncompleted after Substantial Completion but that must be completed prior to Final Completion.

### **Owner's Right to Partial Use**

13.8 When provided for in the Contract Documents or agreed to in writing by the Owner and the Contractor, the Owner may notify the Contractor and begin using a portion of the Work even though it is not Substantially Complete. The Contractor, the Owner and the Engineer shall agree on and document responsibilities for security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that portion of the Work being used by the Owner. The Owner, the Contractor and the Engineer shall inspect such portion of the Work and shall prepare a list of work to be completed or corrected before final acceptance. The Owner's use of any portion of the Work shall not constitute final acceptance of that portion of the Work prior to Final Completion and acceptance of the Work as a whole. The Owner shall

allow the Contractor reasonable access to complete or correct work in areas being used by the Owner. Partial beneficial occupancy shall not relieve the Contractor of Liquidated Damages unless the Contract Documents expressly provide for and identify the portion of Work that may be considered Substantially Complete before the remaining portions of the Work.

#### **Contractor's List of Deficiencies**

13.9 When the Contractor considers the Work nearly complete, the Contractor shall review the Contract Documents, inspect the Work and prepare a list of deficiencies (Punch List). The Contractor shall complete or correct the items on the Punch List until, in the Contractor's opinion, the Work is Substantially Complete and ready for occupancy and use by the Owner. The Contractor shall then deliver the Punch List to the Engineer and notify the Engineer in writing that the Contractor believes the Work is Substantially Complete and ready for a Semi-Final Inspection.

#### **Semi-Final Inspection, Substantial Completion**

13.10 When the Work is ready and the Contractor so notifies the Engineer in writing, the Engineer will make a Semi-Final Inspection and may add additional items to the Contractor's Punch List. As a result of this inspection, the Engineer may determine that (1) the Work is not sufficiently complete to warrant a Semi-Final Inspection, additions to the Contractor's Punch List, or the preparation of a Final Punch List, (2) the Work is sufficiently complete for the Engineer to prepare a Final Punch List but certain incomplete or Defective Work prohibits use of the Work for its intended purpose and therefore, the Work is not Substantially Complete, or (3) that the Work is Substantially Complete and usable for its intended purpose and the Engineer can prepare a Final Punch list. In preceding cases 1 and 2, the Contractor shall continue the Work and call for a second Semi-Final Inspection when the Work is ready. In case (3), the Engineer will prepare a Final Punch List and a notice of Substantial Completion which shall establish the date of Substantial Completion and shall state the time agreed to by the Owner and the Contractor (not to exceed 30 days) in which the Contractor shall complete all work ready for Final Inspection. The date of Substantial Completion shall be revised if necessary such that it is no more than 30 days prior to the actual date of Final Completion. The Engineer shall attach a copy of the Final Punch List to the notice of Substantial Completion. If the Contractor does not achieve Substantial Completion on the second attempt, it shall reimburse the Owner the cost of the Engineer's services for additional inspections.

#### **Final Inspection, Final Completion**

13.11 When the Contractor has completed or corrected all the items on the Engineer's Final Punch List and has made all required final submittals, the Contractor shall give the Engineer written notice that the Work is ready for Final Inspection and acceptance and upon receipt of a final Application for Payment, the Engineer shall make a Final Inspection. If the Engineer finds the Work is not fully complete, it shall notify the Contractor of items still requiring completion or correction. The Contractor shall immediately correct these deficiencies and call for a reinspection. When the Engineer finds to the best of the Engineer's knowledge, information and belief, and on the basis of the Engineer's observations and inspections, the Work is acceptable and fully complete in accordance with the Contract Documents, and when all final submittals have been made, the Engineer will recommend that the Owner issue and file a Notice of Completion, designating Final Completion, make Final Payment and Accept the Work in accordance with the terms and conditions of the Contract Documents.

13.12 Neither the Engineer's failure to include an item on the Final Punch List, nor making of the Semi-Final or the Final Inspection, nor recommendation of final acceptance shall alter the Contractor's responsibility to complete all Work in accordance with the Contract Documents.

#### **Final Payment**

13.13 Within 10 days after the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to defend and indemnify the Owner against such liens, the Owner shall accept the Work and file a Notice of Completion. Final Payment shall not become due until 60 days after the Owner files a Notice of Completion and there being no liens or stop notices filed. If any lien or stop notice remains unsatisfied, the Contractor shall immediately take all steps necessary to remove all liens or stop notices before Final Payment is made. If any liens are filed or exist after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such liens, including all costs and reasonable attorneys' fees.

#### **Waiver of Claims**

13.14 The making of Final Payment shall constitute a waiver of claims by the Owner except those arising from:

- .1 Liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 Failure of the Work to comply with the requirements of the Contract Documents; or
- .3 Terms of the one-year guarantee period and special warranties required by the Contract Documents.
- .4 Any of the Contractor's continuing obligations under the Contract Documents.

13.15 Acceptance of Final Payment by the Contractor, a subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

## **ARTICLE 14 - TERMINATION**

### **Termination by the Owner for Cause**

14.1 The Owner may terminate all or part of the Contract if the Contractor:

- .1 Persistently fails to provide enough workers or materials to properly pursue the Work as required to complete the Work within the Contract Time;
- .2 Persistently fails to perform the Work in accordance with the Contract Documents including, but not limited to providing monthly updates to the schedule of Work and monthly updates to Record Drawings, or to correct or replace Defective Work when directed to do so;
- .3 Fails to make payment to subcontractors or material suppliers;
- .4 Becomes insolvent, commences any form of voluntary bankruptcy proceedings, has any petition or action filed against it under any bankruptcy code or law, makes a general assignment for the benefit of creditors, or if a trustee, receiver or agent is appointed under law to take charge of Contractor's property or operations for the benefit of creditors;
- .5 Persistently disregards laws, regulations, rules or orders of public bodies having jurisdiction or persistently disregards the authority of the Engineer or Owner;
- .6 Fails to retain a valid Contractor's license of the required class in the applicable jurisdiction; or
- .7 Otherwise commits a material breach of the Contract.

14.2 When any of the above reasons exist and without prejudice to any other rights or remedies the Owner may have, and after giving the Contractor and the Contractor's Surety 7 days written notice, the Owner may terminate the employment of the Contractor and, subject to any prior rights of the Surety, the Owner may:

- .1 Take possession of the site and of all material, tools and construction equipment on the site owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to paragraph 5.9; and
- .3 Complete the Work by any reasonable method the Owner may select.

14.3 When the Owner terminates the Contract for cause, the Contractor shall not be entitled to further payment until the Work has been completed.

14.4 If the cost of completing the Work, including additional engineering services, attorney's fees and administrative expenses made necessary thereby, exceeds the unpaid Contract Price, the Contractor shall pay the difference to the Owner. This obligation for payment shall be binding after termination of the Contract. If the cost of completing the Work including costs for engineering, legal, and administrative services minus the Contractor's unearned overhead and profit computed in accordance with paragraphs 9.11.6 and 9.11.7, is less than the unpaid Contract Price, the difference and other consequential costs shall be paid to the Contractor.

14.5 If it has been adjudicated or otherwise determined that the Owner has erroneously or negligently terminated the Contractor for cause, then the termination shall automatically convert to a Termination by Owner for Convenience as set forth in Article 14.7

### **Suspension by the Owner for Convenience**

14.6 The Owner, without cause, may issue written order giving the Contractor 7 days notice to suspend, delay or interrupt the Work in whole or in part. The order shall fix the dates on which the work shall cease and resume.

14.7 If a suspension, delay, or interruption of the Work ordered by the Owner for convenience causes an increase or decrease in the cost of performing the Contract, the Contract Price shall be adjusted as agreed by the Owner and the Contractor or in accordance with the method for determining the cost of changes in Article 9. The Contract Price shall not be adjusted if the Contractor's performance would otherwise have been suspended, delayed or interrupted due to causes for which the Contractor is responsible.

### **Termination by the Owner for Convenience**

14.8 The Owner may terminate all or part of the Contract without cause by giving the Contractor 7 days

written notice. Such termination shall not prejudice any other right or remedy the Owner may have under the Contract. If the Contract is terminated without cause, the Contractor shall be paid for all work executed as of the date of termination plus reasonable termination expenses including direct, indirect and consequential costs but the Contractor shall not be paid for anticipated profit on work not performed.

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

14.9 If, through no act or fault of Contractor, the Work is suspended for a period of more than 90 days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any Application for Payment within 30 days after it is submitted, or the Owner fails for 60 days to pay the Contractor any sum finally determined to be due, the Contractor may, upon 7 days' written notice to the Owner and the Engineer, terminate the Agreement and recover from the Owner payment for all Work performed and any expense sustained plus reasonable termination expenses. In addition and in lieu of terminating the Agreement, if the Engineer has failed to act on an Application for Payment or the Owner has failed to make any payment as aforesaid, the Contractor may, upon 7 days' written notice to the Owner and the Engineer, stop the Work until payment of all amounts then due is received. The provisions of this paragraph shall not relieve the Contractor of the obligations to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with the Owner.

## **ARTICLE 15 - MISCELLANEOUS**

### **Method for Giving Notices**

15.1 Written notice shall only be considered to have been given if delivered in person to the individual, partner of the partnership or joint venture, or officer of the corporation for whom intended or if sent by registered or certified mail to the address given in the Agreement unless amended by written notice. Notice to the Contractor's superintendent shall be considered notice to the Contractor. Notice to the Resident Engineer shall be considered notice to the Engineer. Notice to the Owner's Project Representative or Manager shall be considered notice to the Owner.

### **Rights and Remedies**

15.2 Duties, obligations, rights and remedies prescribed by the Contract Documents shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed by or available under law.

### **Failure to Act Not a Waiver of Rights**

15.3 Except as expressly provided in the Contract Documents, no action or failure to act by the Owner, Engineer, Design Engineer or Contractor shall constitute a waiver of a right afforded or duty imposed under the Contract. No such action or failure to act shall constitute approval of or acquiescence in failure to perform in accordance with the Contract Documents or any other breach of contract.

### **Severability of Provisions**

15.4 The finding under law that any one or more provisions or any portion of a provision in the Contract Documents is invalid, unenforceable, or illegal shall not impair the validity or enforceability of any other provision or of the Contract Documents as a whole. In the case of invalidity or enforceability of any provision or portion thereof, the provision shall be rewritten and enforced to the maximum extent permitted by law to accomplish as near as possible the intent of the original provision.

### **Right to Audit**

15.5 Maintenance, Inspection, and Audit of Records. All books, account, reports, files, correspondence, data and other records relating to this contract shall be maintained by the Contractor, its subcontractors and material suppliers and shall be subject to all reasonable times to review, inspection, and audit by the Owner, Engineer and their agents at all times during performance of the Work and for a period of five (5) years after Final Completion of the Work. Such records shall be produced by the Contractor and/or the subcontractor or Material Supplier within a reasonable time at a place designated by the Owner or Engineer, upon written notice to the Contractor.

15.5.1 Accounting System. Contactor shall exercise such controls as may be necessary for proper financial management of the Work. Such accounting and control systems shall comply with prevailing custom and practice for similar projects, be satisfactory to Owner and shall include preservation of records for a period of four (4) years after Final Completion, or for such longer period as may be required by Applicable Law.

15.5.2 Books and Records. Contractor shall keep, and shall require provisions to be included in all contracts entered into by subcontractors and suppliers requiring the subcontractors and suppliers to keep, full and detailed books, records, information, materials and data, of every kind and character (hard copy, as well as computer readable data if it exists), that have any bearing on or pertain to any matters, rights, duties or



obligations relating to the Project, Work or Contract, including, without limitation, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, change orders, change order requests, estimates, field orders, schedules, diaries, logs, reports, shop drawings, samples, exemplars, drawings, specifications, invoices, delivery tickets, receipts, vouchers, canceled checks, memoranda; accounting records; job cost reports; job cost files (including complete documentation of negotiated settlements); backcharges; general ledgers; documentation of cash and trade discounts earned; insurance rebates and dividends and other documents relating in any way to any claims, charges or time extensions asserted by Contractor of any of the subcontractors.

15.5.3 Inspection and Copying. Contractor shall allow, and shall require provisions to be included in all contracts entered into by subcontractors allowing, Owner, Engineer and their authorized representative(s), auditors, attorneys and accountants, upon twenty-four (24) hour notice to Contractor, full access to inspect and copy all its aforesaid books and records at a location designated by Owner or Engineer and within 200 miles of the Project.

15.5.4 Noncompliance by Contractor. Contractor's compliance with this Article 15.5 et seq, shall be a condition precedent to maintenance of any judicial or extra-judicial action by Contractor against Owner or Engineer. In addition to and without limitation upon Owner's or Engineer's other rights and remedies for breach, including any other provisions for withholding set forth in the Contract documents, Owner shall have the right, exercised in its sole discretion, to withhold from any payment to Contractor due under a current application for payment an additional sum of up to ten percent (10%) of the total amount set forth in such

application for payment, until Contractor and the subcontractors have complied with any outstanding and unsatisfied request by Owner under this Article 15.5. Upon compliance with this Article 15.5, any such monies withheld shall be released to Contractor.

15.5.5 Special Enforcement by Owner or Engineer. Contractor agrees that any failure by Contractor or any subcontractor to provide access to books and records as required by this Article 15.5 et seq. shall be specifically enforceable, by issuance of a preliminary and/or permanent mandatory injunction by a court of competent jurisdiction based on affidavits submitted to such court and without the necessity of oral testimony, to compel Contractor to permit access, inspection, audit and/or reproduction of such books and records or the require delivery of such books and records to Owner and Engineer for inspection, audit and/or reproduction.

### **Governing Law**

15.6 The Contract shall be governed by the law of the place where the project is located.

15.7 Survival of Terms. Any indemnity, warranty or guarantee given by Contractor to Owner or Engineer under this Agreement shall survive the expiration or termination of the Agreement and shall be binding upon Contractor and their subcontractors and suppliers until any action is barred according to terms in the Agreement or by the applicable statute of limitations or statute of repose. All obligations of Contractor under this Contract shall survive the expiration or termination of this Contract.

END OF GENERAL CONDITIONS

**From:** Company Name  
Mailing Address  
City, ST Zip  
Name

**Page:** 1 of 2  
**Date:** \_\_\_\_\_  
**KJ Job No.:** \_\_\_\_\_  
**Project Name:** \_\_\_\_\_

**Request for Information**

**Originator:** \_\_\_\_\_ **Drawing Reference:** \_\_\_\_\_

**Requested Date of Response:** \_\_\_\_\_ **Specification Section:** \_\_\_\_\_

Written requests for information will not be considered without an accompanying completed copy of this RFI. By submission of this form the Contractor represents it has carefully reviewed the Contract Documents, coordinated the Work with the appropriate subcontractors, reviewed the field conditions and hereby certifies that the information requested cannot be determined from such efforts as required by the Contract Documents.

The Contractor requests the following information in accordance with the requirements of the Contract Documents.

**Description of Requested Information**

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

**Contractor's Proposed Method of Resolving Issue**

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

**Contractor's Proposed Impact on Project**

Estimated Contract Cost will be increased decreased unchanged by: \_\_\_\_\_

Estimated Contract Time will be increased decreased unchanged by: \_\_\_\_\_ days.

**Attachments**

Empty box for attachments.

Attach supporting documentation sufficient for Engineer to evaluate Request for Information, including documentation of field conditions. Forms submitted without adequate documentation will be returned without comment for further clarification.

Contractor's signature below signifies acceptance of responsibility for accuracy and completeness of information included in this Request for Information Form.

**Authorized Signature:** \_\_\_\_\_

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

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

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

**Request for Information No.: XX and Response**

**Response Date:** \_\_\_\_\_  
**Specification Section:** \_\_\_\_\_  
**Drawing Reference:** \_\_\_\_\_

**KJ Job No.:** \_\_\_\_\_  
**Project Name:** \_\_\_\_\_  
**Page:** 2 of 2

**Response**

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

If Contractor estimates an impact on Project time or price based upon Response, submit Reply within 5 working days of receipt.

**Respondent:** \_\_\_\_\_  
**Company:** \_\_\_\_\_

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

**Issued for Kennedy Jenks by:** \_\_\_\_\_

**Contractor's Reply To Response:**

Estimated Contract Cost will be increased decreased unchanged by: \_\_\_\_\_

Estimated Contract Time will be increased decreased unchanged by: \_\_\_\_\_ Days.

**Comments**

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

<u>Distribution</u>	<u>RFI</u>	<u>Response</u>	<u>Reply</u>
Owner	_____	_____	_____
Engineer	_____	_____	_____
Contractor	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
File	_____	_____	_____



Response Date: \_\_\_\_\_ KJ Job No.: \_\_\_\_\_  
 Specification Section: \_\_\_\_\_ Project Name: \_\_\_\_\_  
 Page: 2 of 2

**Response**

Item	KJ Action	Refer to Comment	Manufacturer or Supplier	Title of Submittal / Drawing

A. The action(s) noted above have been taken on the enclosed document(s).

- NET = No Exceptions Taken
- MCN-N = Make Corrections Noted, No Resubmittal Required
- MCN-R = Make Corrections Noted, Partial Resubmittal Required
- A&R = Amend and Resubmit
- NR = Not Reviewed
- RR = Rejected, Resubmit
- RA = Receipt Acknowledged

Comment(s):

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

B. Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with the requirements of the Drawings and Specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating its work with that of all other trades, and performing its work in a safe and satisfactory manner.

\_\_\_\_\_  
 Responder: type name here - sign above

Distribution	Submittal	Encl.	Response
Owner	_____	_____	_____
Engineer	_____	_____	_____
Contractor	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
File	_____	_____	_____

**From:** Company Name  
Mailing Address  
City, ST Zip  
Name

**Page:** 1 of 3  
**Submission Date:** \_\_\_\_\_  
**KJ Job No.:** \_\_\_\_\_  
**Project Name:** \_\_\_\_\_

**Specification Section:** \_\_\_\_\_ **Prior Submittal:** \_\_\_\_\_

**Proposed Equivalent**

- A. When the first specified item is followed by a second maker's name and "or equal," the Contractor may submit Proposed Equivalent items for the Engineer's review. Proposed Equivalent items that are in the Engineer's judgment equal to the first specified item in quality, utility, and appearance, will be Favorably Reviewed. Where a product description and first maker's name is followed by "or equal" with no second maker's name, it means the specifier knows of no equivalent product and the Contractor may submit Proposed Equivalent products by other makers for review. Where the term "or equal" is omitted, it means that the named item is required to meet the Owner's needs; no products or makers other than those specified will be considered.
- B. This request shall include adequate technical information to fully describe the function and quality of the item. Submittals of Proposed Equivalent items that are not made within 35 days of the Notice to Proceed will be rejected unless the Engineer has agreed in writing to a later submittal date and the Contractor agrees to comply with all conditions of the Engineer for the late submittal. If the Contractor's second attempt to obtain Favorable Review of a Proposed Equivalent item is unsuccessful, the Contractor shall submit the first specified item.
- C. Inclusion of a second maker's name indicates the maker is acceptable but does not necessarily indicate the maker offers a standard product equal to the first specified item. Items by the second named maker are subject to the same conditions of review and compatibility as other Proposed Equivalent items. Inclusion of a maker's name and/or model number after a specification description is not a representation that the maker will furnish an item meeting the Contract requirements at bid time or at time of need. It is the Contractor's sole responsibility to furnish items meeting the Contract requirements.
- D. The Engineer's review of Proposed Equivalent items is based solely on information provided by the Contractor and on the Contractor's warranty that the proposed item is equal in quality, utility, function and appearance to the first specified item. Favorable Review of a Proposed Equivalent item has the same meaning and is subject to the same limitations that apply to the Favorable Review of Product Data and Shop Drawings described in the Contract Documents.
- E. Submit with proposal:
  - 1. Description of item being proposed including the Manufacturer's model number.
  - 2. Manufacturer's representation that item is equal to or superior to specified item in all respects.
  - 3. Manufacturer's product data.
  - 4. Information about several recent similar installations, including project name, owner's name, address, telephone number, and name of knowledgeable person to contact for information on performance of the product.
  - 5. Whether a reduction in the Contract Price is being proposed and, if so, how much.
  - 6. Any differences between the product specified and the Proposed Equivalent, including the warranty.

**Proposed Equivalent No. XX and Response**

Submission Date:  
Project Name:  
Specification Section:  
Page 2 of 3

F. Certification of Equivalency, Completeness and Accuracy:

We certify that we have reviewed this request in detail and that the item proposed is:

1. Equal to or superior to the specified item
2. Complete and accurate and in complete compliance with the Contract Documents,
3. Compliant with the requirements of "Material and Equipment" in Section 01040, especially the subparagraph titled "Compatibility of Equipment and Material",
4. Compliant with the paragraph titled "Performance Specifications and Contractor Designed Work" in Section 01040,
5. Without any deviations from the Contract Documents, except the following (describe deviation) which have the following advantages and disadvantages:

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

We further represent and warrant to be solely responsible for any extra cost or expense necessary to make the proposed item or service fully equivalent to and compatible with the Contract Documents and meet or exceed the design intent.

If we use the Proposed Equivalent, we agree to comply with all additional requirements imposed upon us by the Engineer and Owner.

Signed by Subcontractor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

Signed by Contractor: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

**Proposed Equivalent No. XX and Response**



Response Date: \_\_\_\_\_ KJ Job No.: \_\_\_\_\_  
 Specification Section: \_\_\_\_\_ Project Name: \_\_\_\_\_  
 Page: 3 of 3

**Response**

Item	KJ Action	Refer to Comment	Manufacturer or Supplier	Title of Submittal / Drawing / Information

A. The action(s) noted above have been taken on the enclosed document(s).

NET = No Exceptions Taken      A&R = Amend and Resubmit      NR = Not Reviewed  
 MCN = Make Corrections Noted      RR = Rejected, Resubmit

**Comment(s):**

Delete or replace this text with your response. Space is limited; attach additional sheets if necessary.

B. Corrections or comments made on the submittal during this review does not relieve the Contractor from compliance with the requirements of the Drawings and Specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating its work with that of all other trades, and performing its work in a safe and satisfactory manner.

\_\_\_\_\_  
 Responder: type name here & sign above

Distribution	Proposed Equivalent	Encl.	Response
Owner	_____	_____	_____
Engineer	_____	_____	_____
Contractor	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
File	_____	_____	_____



**Application for Payment and Engineer's Recommendation No.:**

**9999**



**To:** Name  
Mailing Address  
City/State/Zip

**Date:** Date  
**KJ Job No.:** 000000.00  
**Project:** ProjectName  
**Contract Date:** Date  
**Period To:** Date

**Distribution to:**  
 Owner  
 Engineer  
 Contractor  
 Architect  
 \_\_\_\_\_

**Attn:** Name

**Reviewed By:** Kennedy/Jenks Consultants, Inc.  
Mailing Address  
City/State/Zip

**From:** ContractorName  
Mailing Address  
City/State/Zip

**Prepared By:** Name

**Recommended By:** Name

Contractor's Application for Payment		
1. Original Contract Sum	_____	
2. Net Change by Change Orders	_____	
3. Contract Sum To Date (Line 1 + 2)	_____	
4. Total Completed & Stored to Date (Column G on Page 2)	_____	
5. Retainage:		
a. _____ % of Completed Work (Column D + E)	_____	
b. _____ % of Stored Material (Column F)	_____	
Total Retainage (Lines 5a + 5b or Total in Column I)	_____	
6. Total Earned Less Retainage (Line 4 less Line 5 Total)	_____	
7. Less Previous Payments (Line 6 from prior Applications)	_____	
8. Current Payment Due (Line 6 less Line 7)	_____	
9. Balance to Finish, Including Retainage (Line 3 less Line 6)	_____	
Change Order Summary	Additions	Deductions
Total Changes approved by Owner in previous months		
Total approved this month		
Totals		
Net Changes by Change Order		

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents and that all Work for which previous payments have been received is free and clear of liens, claims, security interests or encumbrances of any kind. The Contractor further warrants that title to all Work covered by this Application for Payment will pass to the Owner no later than the time of payment.

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Contractor

State of: \_\_\_\_\_ County of: \_\_\_\_\_  
Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_

Notary Public: \_\_\_\_\_

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

**Engineer's Recommendation for Payment:** In accordance with the Contract Documents, the Engineer recommends to the Owner that the Contractor is entitled to payment in the amount recommended, subject to withhold, deductions or credits pursuant to the Contract Documents.

Amount Recommended..... \_\_\_\_\_  
By: \_\_\_\_\_ Date: \_\_\_\_\_  
Kennedy/Jenks Consultants, Inc.

This Certificate is not negotiable. The amount recommended is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.



## SECTION 01010

### SUMMARY OF WORK

#### PART 1 - GENERAL

##### 1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The project includes: Replacement of a 600 amp, 240 volt, 3-phase motor control center (MCC), at the Twain Harte Community Services District's water treatment facility, as well as reconnection of existing load equipment to the new unit and provision of temporary power during construction to ensure continuity of service for critical load equipment at the facility.

##### 1.02 CONTRACTOR'S USE OF SITE AND OWNER'S CONTINUED OPERATIONS

- A. The Contractor shall confine its use of the site for work and storage to the Work Area Limits shown on the Contract Drawings. The Contractor's use of adjacent lands and roads for access to move onto and off of the site and for daily access of workers, material and equipment shall be arranged and scheduled to minimize interference with the Owner's continued operations.
- B. The Owner intends to continue operation of portions of its existing facility during all or most of the construction period. The Contractor shall plan and schedule its work to minimize impacting the Owner's continued operations and shall, at all times, maintain safe access for the Owner's operating personnel and equipment.
- C. The Contractor shall be responsible for maintaining safe emergency exiting for the Owner's and Contractor's personnel in all areas affected by the Contractor's work.
- D. If operation of the Owner's existing facility is adversely affected by the Contractor's work, the Owner may suffer a financial loss and may make a claim against the Contractor to recovery its loss.

##### 1.03 DOCUMENTING EXISTING

- A. Prior to commencing the Work, tour the site with the Owner and the Engineer. Examine and document photographically and in writing the condition of existing buildings, equipment, improvements, and landscape planting on or adjacent to the site. This record shall serve as a basis for determination of subsequent damage due to the Contractor's operations and shall be signed by all parties making the tour. Record existing conditions by making a minimum of 20 digital color photographs and a video showing all areas that may be affected during the Work. Provide an electronic copy of photos and video to Owner and Engineer.

##### 1.04 SHUTDOWN OF EXISTING UTILITIES, SERVICES OR OPERATIONS

- A. The facility may be shutdown for no longer than 30 days, during the month of March. The Contractor's Bid shall include the cost of premium time for work required on weekends or outside of normal working hours as necessary to comply with this schedule constraint. Provide temporary power service as shown on the

Drawings to provide uninterrupted power service to all critical loads identified on the Drawings.

#### 1.05 REGULATORY REQUIREMENTS

- A. The codes and regulations together with local amendments when applicable adopted by the State and other governmental authorities having jurisdiction shall establish minimum requirements for this project. This project shall comply with the following:
  - 1. International Building Code (IBC) 2018 Edition and California Building Code (CBC) 2019 Edition
  - 2. International Fire Code (IFC) 2019 edition
  - 3. National Electric Code (NEC) 2017 edition
  - 4. California Fire Code (CFC) 2019 edition
  - 5. California Electric Code (CEC) 2019 edition
  - 6. California Energy Code 2019 edition
  - 7. California Green Building Standard Code (2019)
- B. The latest edition of the requirements in effect at the date of submission of bids shall apply.
- C. General Conditions paragraph 5.11 covers the Contractor's responsibility to comply with laws and codes applicable to Means and Methods for performing the Work.
- D. General Conditions paragraph 5.14 covers the Contractor's responsibility to report code deficiencies in the design to the Engineer prior to proceeding with the Work.
- E. Paragraphs addressing Pre-Engineered Systems and Performance Specifications in other Sections cover the Contractor's responsibility to comply with code requirements when (1) performance specifications are used to describe all or portions of Work or items and (2) when pre-engineered (contractor designed) systems are specified.
- F. In cases where the Contract Documents are more restrictive than applicable codes, the Contractor shall comply with the Contract Documents.

#### 1.06 REFERENCE STANDARDS

- A. When these specifications state that Work or tests shall conform to specific provisions in a referenced standard, specification, code, recommendation or manual published by an association, organization, society or agency the referenced provisions, as they apply to the Work of the Contractor only shall be considered a part of these specifications as fully as if included in total. When these specifications or applicable codes contain higher or more restrictive requirements than those contained in reference standards these specifications or applicable codes shall govern.
- B. The latest edition of a referenced standard published at the time of submission of bids shall apply unless a specific date for the referenced standard is cited in these specifications.
- C. General provisions in referenced standards, specifications, manuals or codes shall not change the specific duties and responsibilities between any of the parties involved in this work from those described in the General Conditions. Provisions in referenced standards with regard to measurement and payment shall not apply to this Work unless specifically cited. See General Conditions paragraph 2.3.

## 1.07 SPECIFICATION LANGUAGE AND STYLE

- A. Many parts of the Specifications as well as notes on the Drawings are written in the active voice and are addressed to the Contractor.
1. When words or phrases requiring an action or performance of a task are used, it means that the Contractor shall provide the action or perform the task. For example: provide, perform, install, furnish, erect, connect, test, operate, adjust or similar words mean that the Contractor shall perform the action or task referred to.
  2. When words or phrases requiring selection, acceptance, approval, review, direction, designation or similar actions are referred to, it means that such actions are the Owner's or the Engineer's prerogative and that the Contractor must obtain such action before proceeding.
- B. Requirements in the Specifications and Drawings apply to all work of a similar type, kind or class even though the word "all" or "typical" may not be stated.

## 1.08 DEFINITIONS

- A. The following terms, when used in the Contract Documents, shall have the meanings listed:

ACCEPTABLE	"acceptable to the Engineer"
PERFORM	"perform all operations required to complete the work referred to in accordance with the intent of the Contract Documents"
PROVIDE	"furnish and install the work referred to including proper anchorage, connection to required utilities or other work, testing, adjustment and startup ready to put in service and perform the intended function"
REQUIRED	"required by the Contract Documents or required to complete the Work and produce the intended results"
SATISFACTORY	"acceptable to the Engineer"
SHOWN	"as indicated on the Drawings"
SITE	"geographical location of the Project and land within the work area shown on the contract drawings and within which the Work will be installed or built"
SPECIFIED	"as written in the Contract Documents including the Specifications and the Drawings"
SUBMIT	"submit to the Engineer"

## 1.09 ABBREVIATIONS

- A. The following acronyms or abbreviations are used in these specifications for the organizations listed.

<u>Abbreviation</u>	<u>Stands for</u>
AASHTO	American Association of State Highway and Transportation Officials
AAMA	Architectural Aluminum Manufacturers Association
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AISC	American Institute of Steel Construction

<u>Abbreviation</u>	<u>Stands for</u>
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute (formerly United States of America Standards Institute)
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CAGI	Compressed Air and Gas Institute
CAL/OSHA	State of California Department of Industrial Relations, Division of Industrial Safety
CAL TRANS	California Department of Transportation
CBC	California Building Code
CBM	Certified Ballast Manufacturers
CBR	California Bearing Ratio
CEC	California Energy Code
CI	Chlorine Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CPSC	Consumer Products Safety Commission
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards for the U.S. Department of Commerce
CTI	Cooling Tower Institute
DFPA	Douglas Fir Plywood Association
EIA	Electronic Industries Association
EPA	U.S. Environmental Protection Agency
ETL	Electronic Testing Laboratory
FM	Factory Mutual Insurance Company
FPS	Fluid Power Society
FS	Federal Specifications
GO 95	General Order No. 95, California Public Utilities Commission Rules for Overhead Electric Line Construction
GO 128	General Order No. 128, California Public Utilities Commission Rules for Underground Electrical Construction
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
IAPMO	International Association of Plumbing and Mechanical Officials
IBC	International Building Code
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society

<u>Abbreviation</u>	<u>Stands for</u>
IFC	International Fire Code
IGCC	Insulating Glass Certification Council
IMC	International Mechanical Code
IPCE	International Power Cable Engineers Association
ISA	Instrument Society of America
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NGVD	National Geodetic Vertical Datum
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Act
PCA	Portland Cement Association
REA	Rural Electrification Administration
SAMA	Scientific Apparatus Makers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
TCA	Tile Council of America
UBC	Uniform Building Code
UFC	Uniform Fire Code
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
USDC	U.S. Department of Commerce
UL	Underwriters Laboratories
WCLIB	West Coast Lumber Inspection Bureau
WQCB	Water Quality Control Board (Regional)
WRCB	Water Resources Control Board

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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## SECTION 01040

### COORDINATION AND PROJECT REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 PROJECT COORDINATION

- A. Coordinate scheduling, submittals and work of various Sections of the Specifications and subcontractors to assure efficient and orderly sequence of interdependent construction. Coordinate construction scheduling with plant and utility shutdowns with requirements and limitations in Section 01010. Provide accommodations for items to be furnished and installed by Owner and labeled "NIC" (not in contract) on the Drawings and for Owner Furnished Contractor Installed (O.F.C.I.) items.

##### 1.02 MECHANICAL AND ELECTRICAL/CONTROLS COORDINATION

- A. The Contractor's superintendent or a specially assigned assistant shall be designated the mechanical/electrical/controls coordinator and shall coordinate the exact location, space priorities and sequence of installation of all mechanical and electrical/controls work with each other and with all other trades. The mechanical/electrical/controls coordinator shall assure compliance with the requirements of this paragraph entitled "Mechanical and Electrical/Controls Coordination".
- B. The location of mechanical and electrical/controls work may be indicated diagrammatically on the Drawings. Actual locations shall follow locations shown on the Drawings as closely as practicable, but shall be altered or adjusted in the field by the mechanical/electrical/controls coordinator as required by the following:
  - 1. Organize mechanical and electrical/controls work to make efficient use of space. Combine similar items into groups; make all runs parallel to or at right angles with building lines.
  - 2. Layout and install work to provide adequate space and access for adjustment, servicing, and maintenance and maximize space available for future installation of additional services or replacement of existing services.
  - 3. Coordinate location of fixtures, registers, grills, outlets, switches, panelboards, pullboxes, access doors, and other exposed mechanical and electrical items with functional and visual elements. Verify location of questionable items with Engineer before proceeding.
- C. Review Shop Drawings and Product Data prior to submission for the Engineer's Review to assure that physical characteristics and service requirements are compatible with contract requirements, field conditions, and other items submitted.
- D. Verify that required services such as electrical power characteristics, control wiring, and utility requirements of items and equipment submitted and furnished are compatible with services provided. Notify Engineer of potential problems prior to ordering items or equipment and prior to installing services or completing construction in areas where services would have to be installed.
- E. Schedule installation sequence of various elements of mechanical and electrical/controls work to achieve optimum compliance with requirements under Mechanical and Electrical/Controls Coordination in this Section.

- F. Conduct regular weekly coordination meetings with affected trades and Engineer to establish and maintain coordination and resolve conflicts or disputes.

### 1.03 CUTTING, FITTING, AND PATCHING

- A. Provide cutting, fitting, or patching required to complete the Work and to make all of its parts fit together properly. Include cutting, fitting, and patching required to:
  - 1. Fit the several parts together and to integrate with other work.
  - 2. Uncover work to install or correct ill-timed work.
  - 3. Provide openings in elements of work for penetrations of mechanical and electrical work.
  - 4. Remove and replace defective and non-conforming work.
  - 5. Remove samples of installed work for testing.
- B. Request guidance from the Engineer prior to beginning cutting or altering construction, which affects:
  - 1. Structural integrity of any element.
  - 2. Functional performance of any element.
  - 3. Integrity of weather-exposed or moisture-resistant elements.
  - 4. Efficiency, maintenance, or safety of elements.
  - 5. Visual qualities of sight-exposed elements.
  - 6. Work by Owner or separate contractor.
- C. Execute cutting and patching using workers that specialize in and are skilled in installing the type of work being cut or patched.
- D. Perform work in accordance with the Contract Documents or in the absence of specific requirements comply with best trade practice for the work involved.
  - 1. Execute work by methods that will avoid damage to other work.
  - 2. Provide proper support and substrates to receive patching and finishing materials.
  - 3. Cut concrete materials using masonry saw or core drill. Locate all reinforcing steel, conduits and pipes with electronic detecting devices prior to cutting or core drilling existing concrete.
  - 4. Replace or patch work with new materials meeting the requirements of these specifications or if not specified matching materials and finishes of existing or adjacent work.
  - 5. Cut wall, ceiling and floor finishes to fit snugly around pipes, sleeves, ducts, conduit, and other penetrations. Provide fire and/or acoustical caulking as required by code or conditions of use.
  - 6. Maintain integrity of wall, ceiling, or floor construction; completely seal voids against smoke, fire and water.
  - 7. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
  - 8. Report any hazardous or unsatisfactory conditions to the Engineer.

### 1.04 ALTERATION PROJECT PROCEDURES

- A. Plan, schedule and perform alteration work as required to minimize impacting the Owner's continued operations. See Section 01010 paragraph titled "Contractor's Use of Site and Owner's Continued Operations."
- B. The existing facility must remain in operation during construction. Schedule utility interruptions, piping connections, and interruption of existing plant operations as

required to permit continued compliance with regulatory requirements and to meet Owner's flow and processing requirements.

- C. Perform cutting, fitting, and patching in accordance with provisions in other paragraphs of this Section. Where new work abuts or aligns with existing work, perform a smooth even transition. When a smooth unnoticeable transition is not feasible cut existing surfaces along a straight line at a natural dividing point and provide a groove or cover plate as recommended by the Engineer.
- D. Provide new construction in accordance with the technical specifications or if not specified provide new construction matching adjacent or similar existing work in material and finish.

#### 1.05 CONNECTIONS TO UNDERGROUND UTILITIES, CONDUITS, OR PROCESS PIPING

- A. Obtain best available current information on location, identification and marking of existing utilities, piping and conduits and other underground facilities before beginning any excavation. In areas where utilities participate in Underground Service Alert, call 1-800-642-2444 in Northern California for information at least 48 hours in advance of beginning work. Give Engineer 24 hours notice before beginning work.
- B. The location of existing utilities and underground facilities known to the Design Engineer are shown in their approximate location based on information available at the time of preparing the Drawings. The actual location, size, type and number of utilities and underground facilities may differ from that shown and utilities or underground facilities may be present that are not shown. See General Conditions Article 3 for the Contractor's responsibilities and for differing conditions that warrant a change in Contract Price.
- C. Use extreme care when excavating or working in areas that may contain existing utilities, process piping, conduits or other underground facilities. Use careful potholing, hand digging and probing to determine the exact location of underground installation. Some locations contain multiple pipes or conduits. Prior to performing any subsurface work, investigate, determine and prepare a plan to turn off or disconnect each utility believed to be in the within 100 feet of the subsurface work in the event of an accidental breach of a utility conduit.
- D. Where connections to existing utilities or other underground facilities is required or where new piping or conduits may cross or interfere with existing utilities or underground facilities, carefully excavate and uncover existing installations to a point 1 foot below the pipe or conduit to determine the actual elevation and alignment. Call the Engineer's attention to differing existing conditions that may require a clarification or change.
- E. Shutdown of existing utilities, services or operations shall be done in accordance with Section 01010.

#### 1.06 FIELD ENGINEERING AND LAYOUT

- A. See General Conditions, Article 3.9 regarding reference points provided by Owner.
- B. General Conditions, Article 3.10 requires the Contractor to accurately layout the Work including the corners of buildings and other structures and the elevation of every floor, deck, roof, tank bottom, and channel.
- C. Employ a licensed Land Surveyor or Civil Engineer OR experienced surveying instrument technician to layout all detailed dimensions and elevations from

reference points. Use recognized engineering survey methods and documentation techniques.

#### 1.07 PRECONSTRUCTION MEETING

- A. Prior to beginning the Work, the Contractor and its key personnel and Subcontractors including the Contractor's Superintendent, Project Manager, and Field Engineer shall attend a meeting with the Owner and the Engineer to discuss the following:
1. Name, Authority, and Responsibilities of Parties Involved
  2. Project Procedures:
    - a. Progress meetings
    - b. Correspondence
    - c. Notification
    - d. Submittal of Product Data, Shop Drawing Samples, and Proposed Equivalents
    - e. Requests for Information
    - f. Response to Requests for Information
    - g. Requests for Quotation
    - h. Work Directive Change
    - i. Change Orders
    - j. Engineer's "Items of Concern List"
    - k. Application for Payment
  3. Temporary Schedule and Contractor's Construction Schedule
  4. Temporary Facilities and Control
  5. Testing During Construction
  6. Contractors Coordination
  7. Mechanical/Electrical Coordination
  8. Maintenance of Record Drawings
  9. Owner Provided Items or Work and Owner Furnished Contractor Installed items
  10. Early Beneficial or Partial Occupancy
  11. Final Testing, Startup, and Balancing
  12. Punch Lists and Project Closeout Procedures
  13. Final Deliverables including Record Drawings, Operation and Maintenance Manuals, and Special Guarantees.

#### 1.08 PROGRESS MEETINGS

- A. The Engineer will conduct weekly progress meetings with Contractor and Owner at job site. Attendance required by Contractor's project manager, superintendent and affected Subcontractors and suppliers. The Engineer will prepare, maintain, and distribute agenda and dated record of: (1) actions required and taken and (2) decisions needed and made.
- B. Agenda:
1. Review critical items/action list.
  2. Review work progress. Compare actual progress with planned progress shown on Contractor's rolling three-week and CPM Construction Schedule. Discuss corrective action required. Compare actual and projected progress with Contractor's CPM Construction Schedule, propose methods to correct deficiencies.
  3. Review status of Submittals; review delivery dates and delivery dates for critical items.

4. Review coordination problems.
5. Schedule needed testing and critical inspections.
6. Review critical requirements for each trade or major piece of equipment prior to beginning work or installation.
7. Discuss Contractor Quality Control.
8. Discuss open items on Engineer's "Items of Concern List."
9. Discuss impact of proposed changes on progress Schedule.
10. Other business.

#### 1.09 PERFORMANCE SPECIFICATIONS AND CONTRACTOR DESIGNED WORK

- A. Work under this Contract may be specified by a combination of descriptive, performance, reference standard and proprietary specifications. In the event of conflict between any of the various specification methods used to specify a single item the order of precedence shall be the order in which the methods are listed in the preceding sentence. The terms used to describe types of Specifications are taken from the Construction Specification Institute (CSI) Handbook of Practice.
- B. Where Specifications are used to define the characteristics of Contractor designed systems, items or components, the Contractor shall be fully responsible to design, engineer, manufacture, and install the systems, items and components to meet the specified functional requirements, performance requirements, quality standards, durability standards and conditions of use as well as all applicable codes, regulations and referenced trade or industry standards. The Contractor shall perform such design by employing engineers licensed in the State in which the Work is being constructed. The Contractor's design submittals shall include calculations and assumptions on which the design is based and shall be stamped and signed by appropriately licensed engineers.
- C. In accordance with General Conditions paragraph 8.13, the Owner and the Engineer shall have the right to rely on the expertise and professional competence of the Contractor's design. Favorable review of the Contractor's design submittal shall not relieve the Contractor from full responsibility for the adequacy of the Contractor's design.

#### 1.10 MATERIAL AND EQUIPMENT

- A. General:
  1. Verify that products delivered meet requirements of Contract Documents and the requirements for Favorably Reviewed submittals.
- B. Compatibility of Equipment and Material:
  1. Similar items, equipment, devices or products furnished under a single specification section shall all be made by the same maker and have interchangeable parts.
  2. In addition, but only if so stated in each affected Specification Section, similar items furnished under two or more Specification Sections shall be made by the same maker and have interchangeable parts.
  3. All similar materials or products that are interrelated or used together in an assembly shall be compatible with each other.
- C. Transportation and Handling:
  1. Transport and handle products in accordance with manufacturer's instructions.

2. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
  3. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- D. Storage and Protection:
1. Store and protect products in accordance with manufacturer's instructions. Seals and labels shall be intact and legible.
  2. Store moisture-sensitive products including finish woodwork, gypsum products, acoustical products, motors, electrical equipment, instruments and controls in weather-tight, humidity- and temperature-controlled enclosures.
  3. For exterior storage of fabricated products, place items on sloped supports, aboveground.
  4. Cover products subject to deterioration from moisture, dust, or sunlight with opaque watertight but breathable sheet covering. Provide ventilation to avoid condensation.
  5. Provide offsite storage and protection including insurance coverage when site does not permit onsite storage or protection.
  6. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
  7. Provide facilities, equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
  8. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- E. Installation Standards and Manufacturers' Recommendations:
1. Install all products and materials in strict compliance with the most restrictive of the following:
    - a. The manufacturer's or provider's written instructions or recommendations. Follow step-by-step installation procedures.
    - b. Recommendations of referenced trade associations or standards.
    - c. The Contract Specifications and Drawings.
  2. Where conflicts exist, present alternatives with advantages and disadvantages to Engineer for decision.
- F. If reference standards or manufacturer's instructions contain provisions that would alter or are at variance with relationships between the parties to the Contract set forth in the Contract Documents, the provisions in the Contract Documents shall take precedence. See General Conditions paragraph 2.3.

#### 1.11 BACKING, SUPPORTS AND FASTENERS

- A. Provide backing, supports, bracing, fasteners and other provisions required for the proper support and attachment of all work. Backing, supports, bracing and fasteners shall be sized to resist vertical and horizontal loads including seismic and wind loads required by codes listed under Regulatory Requirements in Section 01010 and in accordance with Seismic Design Requirements in Section 01190. Where finishes in existing facilities must be removed to install backing or where finishes are installed in new construction prior to installing backing the Contractor shall remove finishes, install backing and reinstall finishes.
- B. Use of explosive powder-driven fasteners is NOT PERMITTED.

- C. Low velocity, pneumatic-type, power-driven fasteners may be used only where specifically shown, specified or approved and only where they meet the structural requirements for a particular assembly with a safety factor of at least 400 percent. Power-driven fasteners may not be used for electrical or mechanical installations or to attach any items loaded in withdrawal or subject to vibration.

## 1.12 SAFETY

- A. In accordance with generally accepted construction practice, applicable law and the General Conditions, especially paragraphs 5.3, 5.20 through 5.28 and 7.3, the Contractor shall be solely and exclusively responsible for and have control over:
  - 1. Construction means, methods, techniques, sequences, procedures and for coordinating all portions of the Work under the Contract Documents.
  - 2. Safety of employees engaged in the work while on and off the site.
  - 3. Safety of the Owner, the Engineer, the Design Engineer, and others who may visit or be affected by the work.
  - 4. Safety of the work itself including material and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's subcontractors or sub-subcontractors.
  - 5. Safety of other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.
  - 6. Safety programs, equipment and protective devices required to assure the safety of persons and property for whom/which the Contractor is responsible.
- B. The Owner, the Engineer, and the Design Engineer and each of their officers, employees, agents and consultants shall not be responsible for any construction means, methods, techniques, sequences, nor for safety in, on or about the site, nor for coordinating any part of the Work.
- C. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.
- D. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, necessary fences and other safeguards for safety and protection of persons and property on and off the site and shall: (1) post danger signs and other warnings against hazards, (2) promulgate safety regulations, and (3) notify owners and users of adjacent sites and utilities when the Contractor's operations may affect them.
- E. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated by the Contractor in writing to the Owner and Engineer.
- F. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs required in connection with the Work and shall send copies of all accident, injury or work-related illness reports and of all notices of unsafe conditions to the Engineer.
- G. The Contractor shall not load or permit heavy weights to be placed on any part of the construction or site so as to endanger its safety.

- H. The duties of the Owner, the Engineer and the Design Engineer in conducting review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's work methods, equipment, bracing, scaffolding or safety measures in, on, or near the construction site. See General Conditions, paragraph 7.3.
- I. The Contractor is hereby informed that work on this project could be hazardous. The Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instructions as required to prevent injury to personnel and damage to property, and to comply with all applicable laws and regulations including State OSHA, Federal OSHA, and other regulations referenced in these Contract Documents.
- J. The Contractor shall, at all times, maintain the job in a condition that is safe for the Owner, the Engineer and their consultants to make site visits and to conduct construction reviews. If the Owner or the Engineer cannot allow personnel to visit the job because it is not safe, the Contractor is not providing required safe access to the Work as required by General Conditions, paragraph 12.2.
- K. The Contractor shall prepare a Safety Plan meeting the requirements of applicable regulations. As a minimum, the Contractor's Safety Plan shall set forth definite procedures for informing workers about safety, for instructing workers in safe practices, for assuring that workers are using appropriate safety equipment and safe work practices and for reporting accidents.

#### 1.13 EXCAVATION AND TRENCHING; WORK WITHIN CONFINED SPACES

- A. Submit specific plans to the Owner showing details of provisions for worker protection from caving ground in accordance with Section 6705 of the California State Labor Code. The detailed plans shall show the design of shoring, bracing, sloping banks or other provisions and shall be prepared, signed and stamped by a Civil or Structural Engineer licensed in the State in which the Work is performed and retained by the Contractor. The Owner's acceptance of the detailed plans submitted is only an acknowledgment of the submission and does not constitute review or approval of the designs, design assumptions, criteria, completeness, applicability to areas of intended use, or implementation of the plans, which are solely the responsibility of the Contractor and its Registered Engineer.
- B. Work within Confined Spaces: Work within confined spaces is subject to applicable laws, regulations and safety orders including applicable California Tunnel Safety Orders.
- C. The foregoing provisions do NOT reduce the requirement for the Contractor to maintain safety in ALL operations performed by the Contractor or its Subcontractors.

#### 1.14 CONTRACTOR'S QUALITY CONTROL

- A. The Contractor shall be fully responsible for inspecting the work of its suppliers and subcontractors to assure that the work when completed will comply with the standards for materials and workmanship required by the Contract Documents. See General Conditions paragraph 13.9.
- B. Inspections, periodic observations and testing performed by the Owner or the Engineer are for the Owner's benefit and information only and shall not be



construed as partial or incremental acceptance of the work and shall not be deemed to establish any duty on the part of the Owner or the Engineer to the Contractor, its subcontractors or suppliers. See General Conditions paragraphs 7.5 and 12.10.

- C. The Engineer will have authority to reject Defective Work. The Engineer will have authority to require additional inspection or testing of the Work whether or not such Work is fabricated, installed or completed. Neither this authority of the Engineer nor a decision not to exercise such authority shall give rise to a duty or responsibility of the Engineer to the Contractor, subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.
- D. Observations by the Engineer or tests, inspections or approvals by others shall not relieve the Contractor from its obligation to perform the Work in accordance with the Contract Documents.
- E. The Contractor shall:
  - 1. Monitor quality control over suppliers, manufacturer, products, services, site conditions, and workmanship, to produce work of specified quality.
  - 2. Comply fully with manufacturer's installation instructions, including performing each step in sequence as recommended by the manufacturer.
  - 3. Submit a Request for Information (RFI) to the Engineer before proceeding with work when manufacturers' instructions or reference standards conflict with Contract Documents.
  - 4. 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.
  - 5. Perform work by persons specializing in the specific trade and class of work required and qualified to produce workmanship of specified quality.
  - 6. Secure products in place with positive anchorage devices designed and sized to withstand seismic, static and dynamic loading, vibration, and physical distortion or disfigurement.
- F. If reference standards or manufacturers' instructions contain provisions that would alter or are at variance with relationships between the parties to the Contract set forth in the Contract Documents, the provisions in the Contract Documents shall take precedence.
- G. The Contractor shall provide assistance required by the Engineer to adequately inspect the Work including ladders, scaffolding, lighting, ventilation and other aids to facilitate access and provide a safe working environment.

#### 1.15 TESTING LABORATORY SERVICES AND CERTIFIED LABORATORY REPORTS

- A. Provide testing services in accordance with General Conditions Article 12 and specific requirements contained in each technical specification section. Submit Certified Laboratory Reports required by technical specification sections.
- B. Unless otherwise specified, the Contractor shall arrange and pay for tests, inspections and approvals other than Special Inspections that are required by laws, ordinances, rules, regulations, orders of public authorities having jurisdiction or by the Contract Documents. All such tests, inspections and approvals shall be performed by an independent testing laboratory or inspection agency acceptable to the Engineer or to the appropriate public authority. Samples to be tested and items of work to be inspected will be selected by the Engineer or the public authority requiring the test or inspection. Test reports, inspection reports and certificates

shall be submitted directly to the Engineer by the performing laboratory or agency. The Contractor shall notify the Engineer at least two (2) days prior to all tests and inspections to permit observation by the Engineer.

- C. The Contractor shall provide access for Special Inspections and notify the Owner two (2) working days in advance of when work requires Special Inspection.

PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

## SECTION 01190

### SEISMIC REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section is applicable to the following secondary structural system elements, non-structural components, and/or equipment supported by structures.
  - 1. Mechanical, electrical, and plumbing equipment and appurtenances, including, but not limited to:
    - a. New MCC Sections
  - 2. Conduit, piping, cable trays, raceways, ducts and similar systems.
  - 3. All equipment specifically listed in this specification.

##### 1.02 REFERENCES

- A. American Society of Civil Engineers Standard ASCE 7-16, Minimum Design Loads for Buildings and Other Structures, Chapters 11, 13, 15.
- B. International Building Code (IBC) Section 1613.
- C. Additional Building Codes as referenced in 01040
- D. California Building Code, 2019 Edition

##### 1.03 DEFINITIONS

- A. Engineer of Record: The Design Engineer responsible for the preparation of Contract Documents.
- B. Specialty Engineer: Structural or Civil Engineer licensed in the State where the project is being built responsible for specific elements of the primary structural system, the secondary structural system, non-structural elements and/or equipment supported by structures. The Specialty Engineer shall be provided by the Contractor.

##### 1.04 GENERAL DESIGN REQUIREMENTS

- A. The Contractor and Specialty Engineer are responsible for producing structural designs that resist applicable loads including: Dead, Live, Wind, Seismic, Fluid, Snow, Rain, Earth, operational, or other special loads applicable to the component being designed.
- B. Minimum design loads shall be based on guidelines given in this Section, the Drawings, ASCE 7-16, IBC Chapter 16, equipment manufacturer's recommendations and/or other industry accepted design standard for the component being designed (i.e. AWWA D100, API 650, ANSI MH16.1).

##### 1.05 SEISMIC DESIGN REQUIREMENTS

- A. The Contractor is responsible for producing designs that resist the total seismic forces in accordance with the seismic design criteria. The Contractor is responsible for coordinating between the Engineer of Record and the Specialty Engineer. The Contractor is responsible to coordinate the favorably reviewed design in the field,

and shall provide the proposed design, including any modifications required to the primary structure, at no additional cost to the owner.

- B. The seismic design for non-structural components and equipment shall be in accordance with the IBC Chapter 16, and the required coefficients and factors for determining the total design seismic forces are provided in the Seismic Design Criteria in Paragraph E below.
- C. Coordinate the layout so that adequate space is provided between items for relative motion. Provide additional supports and restraints between items of different systems when necessary to prevent seismic impacts or interaction.
- D. Total seismic forces shall be determined in accordance with the following seismic design criteria coefficients for elements of structures, non-structural components, equipment supported by structures, and nonbuilding structures:
  - 1. Spectral Acceleration 1-Second Period,  $S_{D1} = 0.237$
  - 2. Spectral Response Acceleration at Short Period,  $S_{DS} = 0.384$
  - 3. Seismic Design Category = D
  - 4. Importance Factor,  $I = 1.5$
  - 5. Component Importance Factor,  $I_p = 1.5$
  - 6. Components Coefficient,  $a_p = A_s$  as noted in ASCE 7
  - 7. Components Coefficient,  $R_p = A_s$  as noted in ASCE 7
  - 8. Response Modification Factor,  $R = A_s$  as noted in ASCE 7
- E. Design non-building structures in accordance with chapter 15 of ASCE 7-16; all designs utilizing chapter 15 shall include the design and anchorage of the entire non-building structure.
- F. Design anchorages of all elements of structures, nonstructural components, and equipment supported by structures, to resist static and dynamic operational loads, plus total seismic loads specified in the IBC, ASCE 7 16 Section 13.3.1, and as follows:
  - 1. For suspended equipment, multiply dead load by 1.2 and add 0.2SDS to account for vertical seismic effects in the downward direction.
  - 2. For anchorage uplift, multiply dead load by 0.9 and subtract 0.2SDS if used to reduce vertical seismic effects.
  - 3. Post-installed anchors installed in concrete shall be prequalified for seismic application in accordance with ACI 355.2.
- G. Design Basis and Coordination: Contractor shall note that the layout of the structure and equipment pads is based on the first named manufacturer and model for the equipment to be anchored.
  - 1. Contractor shall coordinate all attachments and related work and shall provide connections as noted in the favorably reviewed shop drawings.
  - 2. For all suppliers, if the dimensions required by the Contractor's submitted anchorage calculations deviate from those provided on the Contract Drawings, Contractor shall note the deviation in the submittal for review and provide the favorably reviewed pad at no additional cost to the Owner.
  - 3. If a model or manufacturer other than the first name supplier is submitted for use by the Contractor, Contractor shall coordinate all related work and deviations from the Contract Drawings.
  - 4. Where Contractor's specialty engineer proposes a deviation from the contract drawings for any manufacturer, and that deviation is favorably reviewed by the Engineer, Contractor shall provide that modification to the structure at no additional cost.

## 1.06 DESIGN REQUIREMENTS FOR PIPING, CONDUIT, AND DUCTS

- A. The Contractor is responsible for producing designs for support of piping, conduit, duct or other systems to resist total seismic forces based on the seismic design criteria coefficients specified above, unless shown on the Contract Documents. Except where the technical specifications give specific exemption from resistance of seismic forces, all supports shall be designed to meet seismic criteria.
- B. Where possible, pipes, conduit, and their connections shall be constructed of ductile materials (e.g., copper, ductile iron, steel or aluminum and brazed, welded or screwed connections). Pipes, conduits and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to one-half of the spacing allowed for ductile material.
- C. Seismic restraints may be omitted for the following conditions, where flexible connections are provided between components and the associated ductwork, piping and conduit:
  - 1. Fuel piping less than 1-inch nominal pipe size.
  - 2. All other piping suspended by individual hangers 12 inches or less in length from the top of the pipe to the bottom of the structural support for the hanger, where the hangers are detailed to avoid bending of the hangers and their connections, OR piping of 3 inches nominal pipe size and less ( $I_p=1.0$ ), OR piping of 1-inch nominal pipe size and less ( $I_p$  greater than 1.0).
  - 3. Electrical conduit less than 2.5 inches trade size OR raceways supported by individual hangers 12 inches or less in length from raceway support point to the bottom of the structural support for the hanger, where the hangers are detailed to avoid bending of the hangers and their connections.
  - 4. Air-handling ducts not carrying hazardous gases or used for smoke control with less than 6 square feet in cross-sectional area or weighing less than 17 pounds/foot, OR ducts suspended by individual hangers 12 inches or less in length from the duct support point to the bottom of the structural support for the hanger, where the hangers are detailed to avoid bending of the hangers and their connections.
- D. All trapeze assemblies supporting pipes, ducts and conduit shall be braced to resist the total seismic forces considering the weight of the elements on the trapeze. Pipes, ducts and conduit supported by a trapeze where none of those elements would individually be braced need not be braced if connections from the pipe/conduit/ductwork to component or directional changes do not restrict the movement of the trapeze. If this flexibility is not provided, bracing will be required when the aggregate weight of the pipes and conduit exceed 10 pounds/foot or ducting exceeds 17 pounds/foot. The weight shall be determined assuming all pipes and conduit are filled with water.

## 1.07 SUBMITTALS

- A. Submit in accordance with Section 01300
- B. Seismic Certification of Equipment.
  - 1. Certification is required for the following elements or components:
    - a. MCC sections
  - 2. Certification may consist of one of the following methods:
    - a. Project-specific component design and documentation determined to be acceptable by the Engineer and the authority having jurisdiction.

- b. Written certification from the manufacturer that the equipment is capable of resisting the internal seismic loads due to the loading conditions noted herein and meeting the requirements based on one of the following:
    - 1) Analysis, where section 13.2.2 allows, or
    - 2) Testing meeting ASCE 7-16 section 13.2.5, or
    - 3) Experience Data meeting ASCE 7-16 section 13.2.6.
- C. Shop Drawings for Anchorage Calculations: Where required in the equipment specifications in Divisions 2 through 17 or listed below, submit signed and sealed structural calculations and detailed drawings from the Contractor's Specialty Engineer.
  - 1. Required anchorage items include:
    - a. MCC Sections
- D. Structural calculations and detailed drawings shall be prepared by the Contractor's Specialty Engineer.
- E. Structural calculations and detailed drawings shall clearly show the total design seismic forces which will be transferred from the elements of the structural system, non-structural components, and/or equipment and their attachments to the primary structure. Calculations must be reviewed by Engineer of Record for general conformance with the design criteria and building code and therefore calculations shall include:
  - 1. Seismic and wind load criteria used to determine design lateral and uplift forces. For external equipment, a statement should be made as to whether wind controls for all equipment.
  - 2. Derivation of forces used, including at least one complete sample calculation, showing the process used so that Engineer of Record may determine general compliance. Printouts of spreadsheets without explanation of calculations used to determine values are not acceptable.
  - 3. Adequacy of anchorage to concrete and masonry or attachment to the primary structure to transfer the design forces from the element.
  - 4. Detail drawings shall note:
    - a. Required concrete strength,
    - b. Anchor type, dimensions, and materials.
    - c. Edge distance, spacing, embedment depth, substrate thickness and any supplementary reinforcing required for anchors installed in concrete.
    - d. Required dimensions of equipment pads based on equipment size and edge distance. The Contractor shall coordinate dimensions of equipment pads, including any revisions required to meet the requirements of the favorably reviewed submittal by the Specialty Engineer at no additional cost to the Owner.
- F. The Engineer of Record's review of items within a Specification Section cannot be completed until all related items have been coordinated and submitted for review.
- G. Quality Assurance Submittals
  - 1. Test Reports: Submit test reports for tension testing of anchors.

#### 1.08 QUALITY ASSURANCE

- A. Qualifications: The Contractor is responsible for submitting signed and sealed structural calculations and detailed drawings from a Specialty Structural or Civil Engineer licensed in the State where the project is being built.

- B. Regulatory Requirements: Comply with the adopted and amended versions California Building Code plus clarifications and additions specified in this Section.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 FIELD QUALITY CONTROL

- A. Site Tests: Tension testing of expansion or adhesive anchors utilized for anchorage shall be done in the presence of the Owner's Representative and a report of the test results shall be submitted.
- B. Inspection: Special Inspection shall be provided for high strength bolting or bolts installed in concrete.

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## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 SUBMITTAL PROCEDURES

- A. Accompany each submittal with a Submittal form, General Conditions Exhibit GC-2, which contains the following information:
  - 1. Contractor's name and the name of Subcontractor or supplier who prepared the submittal.
  - 2. The project name and identifying number.
  - 3. Description of the submittal and reference to the Contract requirement or technical specification section and paragraph number being addressed.
- B. Unless otherwise specified, provide submittals in electronic PDF searchable format.
- C. Submittals which include more than one (1) item or piece of equipment shall include a Table of Contents following the standard submittal form and cover sheets
- D. Each submittal shall include a copy of the specification section and all referenced and applicable sections with addendum updates included. For each specification section, check-mark each paragraph to indicate specification compliance with the full paragraph as a whole or marked to indicate requested deviations from specification requirements. Each deviation from the specifications requested by the Contractor shall be underlined and referenced by a unique number in the margin to the right of the identified paragraph. The submittal shall include a detailed written explanation of the reasons for requesting the deviation that is clearly labeled to correspond with the unique number provided in the margin. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal on the basis that the submittal is incomplete and will be returned to the Contractor REJECTED – RESUBMIT with no further consideration.
- E. Where applicable, a copy of the contract document control diagrams and process and instrumentation diagrams relating to the submitted equipment, with addendum updates that apply to the equipment in this Section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "no changes required". Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.
- F. Project Initiation Submittals. At a minimum, provide the following project initiation submittals prior to mobilization.
  - 1. Designation of Superintendent: Include name, address, home telephone number and a brief resume.
  - 2. List of Subcontractors and Major Suppliers: Include address, telephone number and name of responsible party.

3. Schedule of Values, in a form acceptable to the Engineer: See General Conditions Article 13.
- G. The Contractor shall allow 10 days for the Engineer's review of each submittal and 7 days for each resubmittal unless a different period is specified by the Engineer in writing. If the Engineer requests additional information or clarification of a submittal, the 10 days shall be measured from the date the additional information or clarification is received. If the Contractor requires more than two submittals to obtain the Engineer's Favorable Review, the Contractor shall compensate the Owner for the cost of the Engineer's additional review time. The Contractor shall not perform work for which reviewed submittals are required without obtaining Favorable Review of submittals.

#### 1.02 SCHEDULE OF SUBMITTALS

- A. See General Conditions Article 5. Within fifteen (15) days after the Notice to Proceed, submit a Schedule of Submittals showing the date by which each submittal required for Product Review or Product Information will be made. Identify the items that will be included in each submittal by listing the item or group of items and the Specification Section and paragraph number under which they are specified. Indicate whether the submittal is required for Product Review of Proposed Equivalents, Shop Drawings, Product Data or Samples or required for Product Information only.

#### 1.03 PLAN OF OPERATIONS

- A. Before beginning on site work, submit a plan showing Contractor's intended use of the site assigned to it. Show location of enclosing fence, access points and gates. Show location for Contractor's, Subcontractor's, and Engineer's field office and parking. Show location of Contractor's and Subcontractor's work areas and storage areas.

#### 1.04 CONSTRUCTION SCHEDULE

- A. See General Conditions Article 5.
- B. The form of Construction Schedule may be selected by the Contractor but the Schedule shall meet the minimum requirements of General Conditions Article 5.
- C. If the Construction Schedule does not reflect the specified work, or the Contract Time, it will be returned to the Contractor for modification.
- D. Revise the Construction Schedule and resubmit within seven (7) days following any monthly meeting to review Contractor's Application for Payment when Contractor's work is fifteen (15) days or more behind schedule.
- E. Accelerated Work if Required to Meet Schedule: See General Conditions Article 11 Give Engineer three (3) days prior notice of construction that will take place outside of normal work hours or work days. Compensate Owner for extra inspection cost caused by Accelerated Work required to meet Schedule.
- F. Give Engineer three (3) days prior notice of normal work days on which construction will not take place or of scheduled construction that will not take place. Compensate Owner for extra inspection cost resulting from failure to give notice.

## 1.05 SHOP DRAWING, PRODUCT DATA AND SAMPLES SUBMITTED FOR PRODUCT REVIEW

- A. This paragraph covers submittal of Shop Drawings, Product Data and Samples required for the Engineer's review referred to as Product Review submittals in the Technical Specifications (Divisions 2 through 17). Submittals required for information only are referred to as Product Information submittals in the Technical Specifications and are covered in paragraph 1.07. Also see General Conditions Article 8. All shop drawings, product data and samples shall be considered as Product Review submittals unless specifically called out as a Product Information submittal in a technical specification.
- B. The Contractor shall make all Product Review submittals early enough to allow adequate time for the Engineer's review, for manufacture and for delivery at the construction site without causing delay to the Work. Submittals shall be made early enough to allow for unforeseen delays such as:
1. Failure to obtain Favorable Review because of inadequate or incomplete submittal or because the item submitted does not meet the requirements of the Contract Documents.
  2. Delays in manufacture.
  3. Delays in delivery.
- C. Content of Submittals:
1. Each submittal shall include all of the items and material required for a complete assembly, system or Specification Section.
  2. Submittals shall contain all of the physical, technical and performance data required by the specifications or necessary to demonstrate conclusively that the items comply with the requirements of the Contract Documents.
  3. Include information on characteristics of electrical or utility service required and verification that requirements have been coordinated with services provided by the Work and by other interconnected elements of the Work.
  4. Provide verification that the physical characteristics of items submitted, including size, configuration, clearances, mounting points, utility connection points and service access points, are suitable for the space provided and are compatible with other interrelated items that are existing or have or will be submitted.
  5. Label each Product Data Submittal, Shop Drawing and Sample with the information required in paragraph 1.01A of this Section. Highlight or mark every page of every copy of all Product Data submittals to show the specific items being submitted and all options included or choices offered.
  6. Additional requirements for Product Review submittals are contained in the Technical Specification sections.
  7. Designation of work as "NIC" or "by others," shown on Shop Drawings, shall mean that the work will be the responsibility of the Contractor rather than the subcontractor or supplier who has prepared the Shop Drawings.
- D. Compatibility of Equipment and Material: Verify that items contained in the same or in different submittals meet the requirements in the paragraph titled "Material and Equipment" in Section 01040 especially the subparagraphs titled "Compatibility of Material and Equipment."
- E. Requirements for Contractor Designed Items and for First Specified (Named) Items: Verify that items meet the requirements in the paragraph titled "Performance Specifications and Contractor Designed Items" in Section 01040.

- F. Requirements for the Contractor's review and stamping of submittals prepared by the Contractor or by Subcontractors or suppliers prior to submitting them to the Engineer are covered in General Conditions Article 8.
- G. Submittals that contain deviations from the requirements of the Contract Documents shall be accompanied by a separate letter explaining the deviations. See General Conditions Article 8. The Contractor's letter shall:
1. Describe the deviation from the specifications requested and identify with a unique number and reference to the Specification Section paragraph or Drawing requirement. The letter shall include a detailed written explanation of the reasons for requesting the deviation that is clearly labeled to correspond with the unique number provided.
  2. Describe the proposed alternate material, item or construction and explain its advantages and/or disadvantages to the Owner.
  3. State the reduction in Contract Price if any that is offered to the Owner.
- H. Engineer's Review Procedure and Meaning:
1. The Engineer will stamp and mark each Product Review submittal prior to returning it to the Contractor. The stamp will indicate whether or not the review was favorable and what action is required of the Contractor. Review categories "No Exceptions Taken" and "Make Corrections Noted" both indicate Favorable Review.
  2. At a minimum, Favorable Review is contingent on:
    - a. The compatibility of items included in a submittal with other related or interdependent items included in previous or future submittals.
    - b. Future submittal of items related to or required to be part of this submittal that were not included with this submittal.
  3. Favorable Review of a submittal does not constitute approval or deletion of items required as part of the submittal but not included with the submittal. Favorable Review of items included in the submittal does not constitute deletion of specified features, options or accessories that were not included in the submittal.
  4. The action required by the Contractor for each category of review is as follows:
    - a. **NO EXCEPTIONS TAKEN.** NO RESUBMITTAL REQUIRED.
    - b. **MAKE CORRECTIONS NOTED:**
      - 1) **NO RESUBMITTAL REQUIRED.** The Contractor shall make corrections noted prior to manufacture.
      - 2) **PARTIAL RESUBMITTALS REQUIRED.** The Contractor shall submit related accessory or optional items as noted which are required but were not included with the submittal and/or shall resubmit unsatisfactory portions or attributes of items as noted. The Contractor may proceed to manufacture those portions of the submittal that will be unaffected by required resubmittals.
    - c. **AMEND AND RESUBMIT.** The Contractor shall amend and resubmit the submittal as noted or required to comply with the Contract Documents.
    - d. **REJECTED - RESUBMIT.** The item submitted does not comply with the Contract Documents. Resubmit items that comply with the requirements of the Contract Documents.
    - e. **NOT REVIEWED.** The item submitted is incomplete or does not comply with the Contract Documents. The item has not been reviewed and is returned to the Contractor for correction.

- f. **RECEIPT ACKNOWLEDGED.** Receipt of a submittal that is not subject to the Owner's review and approval is acknowledged; and, is being filed for information purposes only. Generally used in acknowledging receipt of Product Information. No further submittal activity is required by the Contractor.
- 5. The letter of transmittal accompanying the returned Product Review submittal may contain numbered notes. Marking a corresponding number on a Shop Drawing or Product Data submittal shall have the same effect as applying the entire note to the submittal.
- I. Re-submittals that contain changes that were not requested by the Engineer on the previous submittal shall be accompanied by a letter explaining the change.
- J. Favorable Review Required Prior to Proceeding: Do not proceed with manufacture, fabrication, delivery or installation of items prior to obtaining the Engineers Favorable Review of Product Review submittals. See General Conditions Article 12.
- K. Intent and Limitation on Engineer's Review:
  - 1. See General Conditions Article 8.
  - 2. The Contractor has primary responsibility for submitting and providing work that complies with the requirements of the Contract Documents. That responsibility cannot be delegated in whole or in part to subcontractors or suppliers. Neither the Engineer's Favorable Review nor the Engineer's failure to notice or comment on deficiencies in the Contractor's submittals shall relieve the Contractor from the duty to provide work, which complies with the requirements of the Contract Documents.

#### 1.06 PROPOSED EQUIVALENTS (SUBSTITUTIONS)

- A. See General Conditions Article 8.
- B. The term "first specified item" or "first named maker" refers to the first product identified in the Specifications by a model number or trade name and/or by a maker's name for a specified item. When the first specified item is followed by a second maker's name and "or equal," the Contractor may submit Proposed Equivalent (Substitution) items for the Engineer's review. Proposed Equivalent (Substitution) items that are in the Engineer's judgment equal to the first specified item in quality, utility, and appearance, will be Favorably Reviewed. Where a product description and first maker's name is followed by "or equal" with no second maker's name, it means the specifier knows of no equivalent product and the Contractor may submit Proposed Equivalent (Substitution) products by other makers for review. Where the term "or equal" is omitted, it means that the named item is required to meet the Owner's needs; no products or makers other than those specified will be considered.
- C. Submit Proposed Equivalent (Substitutions) submittal form, General Conditions Exhibit GC-3 and comply with the submittal requirements for Shop Drawings, Product Data, and Samples submitted for Product Review in another paragraph of this Section.
- D. Time of Submittal:
  - 1. General Conditions Article 8 requires submittal of Proposed Equivalents (Substitutions) within thirty-five (35) days of the Notice to Proceed. The Engineer may agree to a later submittal date if requested in writing within thirty-five (35) days of the Notice to Proceed. The request shall identify the

- item; give the Specification reference, and proposed manufacturer and model number of the item that will be submitted and the proposed submittal date.
2. The Engineer's agreement to a later submittal date shall be in writing and shall not be construed as Favorable Review or acceptance of the manufacturer or item proposed.
- E. Content of submittals shall be the same as that required for Product Data, Shop Drawings and Samples submitted for Product Review in another paragraph of this Section. In addition, the Contractor shall provide information on several recent similar installations of the item to verify its suitability. The information shall include the project name and location, the Owner's name, address, telephone number and name of a knowledgeable person to contact for information on performance of the product.
  - F. When the Contractor has listed specific maker's products submitted with its Bid, no changes will be permitted without submittal of acceptable evidence justifying the change and the Engineer's written approval.
  - G. If a non-equivalent substitute is submitted for review, it shall be accompanied by a proposed reduction in Contract Price which shall include the increased cost of Engineering service required to evaluate the proposed substitute (which shall be paid to the Owner whether or not the substitute is accepted) plus the greater of 1) the difference in price between the first specified item and the item submitted and 2) the difference in value to the Owner between the two items.

#### 1.07 PRODUCT INFORMATION SUBMITTALS

- A. See General Conditions Article 8. Submittal for Informational Purpose Only is an item required for the Owner's permanent records relating, in part, to future maintenance, repair, modification, replacement of work or as otherwise required. The Contractor shall clearly separate information for Product Review from information for Product Information in submittals that include both.
- B. Make Product Information submittals prior to delivering material, products or items for which Product Information submittals are required.
- C. The Contractor has the sole and exclusive responsibility for furnishing products and work that meets the requirements of the Contract Documents.
- D. The Engineer reserves the right to comment on any submittal and to reject any product or work delivered, installed or otherwise at any time that the Engineer become aware that it is defective or does not meet the requirements of the Contract Document. See General Conditions Article 12.

#### 1.08 OPERATION AND MAINTENANCE MANUALS AND PARTS LISTS

- A. Operation and maintenance (O&M) information shall be submitted in a format best suited for the type of manual to be provided to the Owner. Unless otherwise specified, provide information in electronic PDF searchable format.
- B. Provide operation and maintenance manuals and parts list for all equipment furnished under this Contract. Comply with the detailed requirements in Technical Specification sections. Include instructions for delivery, storage, assembly, installation, lubrication, adjusting, startup, operation and maintenance. Provide PDF bookmarks for all items listed in subparagraphs 1 through 5 below.
  1. For all equipment include:
    - a. Startup instructions

- b. Normal operation instructions.
  - c. Trouble shooting instructions.
  - d. Lubrication instructions.
  - e. Maintenance and reinstallation instructions, and manufacturer's recommended preventative maintenance schedule.
  - f. Parts identification.
  - g. List of spare parts recommended to have on hand.
  - h. Operator safety instructions.
  - i. Cleaning instructions.
  - j. Theory of operation to discrete component level.
  - k. Schematic diagrams, flow diagrams, wiring diagrams, logic diagrams, etc. to discrete component level.
  - l. Parts list showing all discrete components with part number,
  - m. Manufacturers' service and maintenance technical manuals.
2. For all Electrical Equipment, provide the following additional information:
    - a. Equipment ratings.
    - b. Calibration curves and rating tables if appropriate.
  3. For Complex Equipment provide in addition:
    - a. Alternate specified operating modes.
    - b. Emergency shutdown instructions.
    - c. Normal shutdown instructions.
    - d. Long-term shutdown instructions.
  4. Operation and maintenance manuals for systems composed of separate pieces of equipment shall include a system explanation of items 1, a, b, and c, and 3a through c, as well as the instructions for each separate piece of equipment.
  5. Provide 2-dimensional and/or 3-dimensional graphical representations of the overall equipment and of individual elements of the equipment in electronic (PDF, JPEG or other format) suitable for use in an electronic O&M manual.
- C. Submit at least fifteen (15) days prior to Facility Startup and Training specified in Section 01650 (01 75 00).
- C. Submit not later than 60 days after Favorable Review of Product Review submittal.
- D. When standard manufacturer's literature is used highlight or mark all copies to shop specific items and options provided.

#### 1.09 MANUFACTURER'S CERTIFICATES

- A. When specified in Technical Specification section, submit manufacturers' certificate to Engineer for review. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate. Certificates may be recent or previous test results on material or product, but must be acceptable to the Engineer.

#### 1.10 CONSTRUCTION PHOTOGRAPHS

- A. Submit digital photographs in electronic JPEG format each month to Engineer with Application for Payment.
- B. Take two site photographs from different directions and five interior photographs to show progress of the Work. Take photographs within five (5) days of each Application for Payment date.
- C. Identify photographs with date, time, orientation and project identification.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION



## SECTION 01500

### CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

#### PART 1 - GENERAL

##### 1.01 TEMPORARY UTILITIES

- A. Sanitary Facilities: Provide and maintain self-contained portable sanitary facilities for the Contractor's, and subcontractor's use. Facilities shall comply with applicable regulations and shall be serviced, cleaned and disinfected frequently.
- B. Temporary Water, Power and Telephone Service:
  - 1. Water: Connect to existing water service and provide backflow prevention devices. Install a meter and reimburse the Owner for the cost of water used.
  - 2. Power: Connect to the existing electrical service with a service disconnect switch. Provide overcurrent and ground fault protection. Provide a meter and reimburse Owner for the cost of energy used.
  - 3. Telephone: Provide temporary telephone service and facsimile line service for the Contractor's and Engineer's use. Pay periodic charges for the telephone and internet services to the Engineer's office.
- B. Temporary Lighting: Provide and maintain lighting for construction operations to achieve a minimum lighting level of 20 foot-candles for rough work and 60 foot-candles for finish work.

##### 1.02 TEMPORARY CONSTRUCTION

- A. The Contractor is solely and exclusively responsible for the design, construction and maintenance of all temporary construction including forms, falsework, shoring, scaffolding, stairs, ladders and all other similar items. See General Conditions paragraphs 5.3 and 5.20 through 5.28 and Section 01040.
- B. Construct adequate and safe forms and falsework to rigidly support partially completed structures. Provide temporary bridges and decking to maintain vehicular and pedestrian access. Design and construct temporary forms, falsework, bridges and decking in accordance with applicable regulations and codes.

##### 1.03 BARRICADES, FENCES AND ENCLOSURES

- A. See General Conditions paragraphs 5.3 and 5.20 through 5.28 and Section 01040.
- B. Barricades: Provide temporary guardrails, ladders, stairs, guards, and barricades to protect persons in accordance with applicable regulations, including California Code of Regulations Title 8 and Cal/OSHA.
- C. Fences:
  - 1. Existing fences enclose the present facilities site. The fences are for the protection and security of the present operating facilities. If it is necessary for the Contractor to remove some of the fences for installation of new work, the Contractor shall provide equivalent temporary protection and security. Replace fencing removed by the Contractor with new fencing of equivalent quality prior to completion of the project.
- D. Enclosures:

1. Provide protective dust covering at doors and other openings to contain dust within the construction area.
2. Provide temporary partitions to prevent dust and moisture from entering Owner-occupied areas and to prevent damage to existing materials and equipment. Temporary partitions shall be of non-combustible construction such as metal studs and gypsum board.
3. Provide temporary watertight closures for openings in exterior surfaces as required to protect interiors from weather, moisture, humidity and extreme temperature.

#### 1.04 PROTECTION OF INSTALLED WORK

- A. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
- B. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by covering surfaces with ½ inch-thick CDX plywood with all joints continuously taped with 2 inch-wide duct tape.
- C. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is unavoidable, provide adequate protection to prevent damage to waterproof membranes and comply with recommendations for protection of the waterproofing or roofing material manufacturer.
- D. Provide heavy planking to protect curbs, gutters, culverts, paving and similar surfaces from damage by heavy equipment or vehicles.

#### 1.05 TEMPORARY CONTROLS

- A. Cleaning:
  1. During Construction: Maintain the site and all work in a clean orderly fashion free of waste debris and rubbish. Store debris in covered containers. Pick up and remove debris daily if required, but not less frequently than weekly. Burning debris on site is not permitted. Remove debris from permanently closed spaces prior to enclosing them. Clean mud from vehicles before leaving the site.
  2. If work under this Contract creates dusty, dirty or unsightly conditions in adjacent areas, the Contractor shall immediately cleanup the affected areas.
  3. Final cleanup is specified in Section 01700.
- B. Dust Control: Employ measures to prevent the creation of dust which may produce damage or nuisance to property or persons. Be responsible for all damage resulting from dust produced by construction operations. Periodically wet down unpaved areas where vehicles are operated.
- C. Erosion and Sediment Control: Employ measures to prevent erosion and trap any sediment created by construction operations before it leaves the site. Prevent sediment from entering streams or other water bodies.
- D. Noise Control: Comply with regulations limiting construction noise levels. Use whisper quite air compressors. Use jack hammers with exhaust mufflers. Prevent noise disturbance to the public and adjacent property owners.
- E. Pest and Rodent Control: Avoid creating conditions conducive to pests and rodents. Comply with regulations governing the use of chemicals to control pests and rodents.

1.06 TRAFFIC REGULATION

- A. Conduct operations so as to offer the least possible obstruction and inconvenience to public traffic. Do not overload or damage paved or improved surfaces, sidewalks, curbs or gutters.
- B. Provide temporary barricades, lights, flag persons and other means to safely control pedestrian and vehicular traffic entering and leaving the project site and on the project site.

1.07 FIELD OFFICES

- A. Contractor's Office at the Site: Maintain a suitable office at the site for the Contractor's Superintendent who shall be authorized to receive submittals, drawings, instructions, or other communications from the Engineer or the Owner.

PART 2 - PART 2 - PRODUCTS (NOT USED)

PART 3 - PART 3 - EXECUTION (NOT USED)

END OF SECTION

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## SECTION 01650

### FACILITY COMMISSIONING, TESTING, AND STARTUP

#### PART 1 - GENERAL

##### 1.01 EQUIPMENT AND FACILITY STARTUP

- A. Commission all systems and equipment to verify performance, function, and correct operation by performing procedures to activate, startup, adjust, test, and demonstrate that the work is in operating order in accordance with the general requirements of this Section and the detailed requirements of the technical sections under the system or equipment specified. To ensure that the work is ready for full-time operation, the procedures shall include verification, balancing, calibration, witness testing, documentation, inspection by equipment manufacturers and operator training where specified.
- B. Notification: Notify the Engineer five (5) days prior to starting each system or piece of equipment.
- C. Coordination: During the startup period, coordinate the operation of the equipment with Engineer, subcontractors, Owner's operators, and manufacturer's representatives.
- D. Furnish test equipment, measuring devices, and supplies required to conduct tests.
- E. Maintain the equipment until acceptance. Provide all lubricants, chemicals, and electricity necessary until acceptance.
- F. Furnish all expendable supplies, gas, water, etc., required for startup, demonstration, and testing, and dispose of all waste or used supplies, water, etc.
- G. Favorably reviewed Operations and Maintenance (O&M) Manuals are required twenty (20) days before the startup of new equipment/facilities.

##### 1.02 SUBMITTALS

- A. Startup Plan, Forms, and Schedule: Prepare a facility startup plan and schedule. The plan shall include test methods and procedures and sample forms for recording commission, test, and startup data.
- B. Provide Affidavits as described in paragraph 1.04 B.
- C. Submit documentation of tests, balancing reports, and the like.

##### 1.03 INITIAL STARTUP AND OPERATION OF FACILITIES

- A. The following listing is a general sequence of startup activity steps to be used in placing facility systems into operation:
  - 1. Perform satisfactory testing of electrical work required prior to energizing of the electrical system.
  - 2. After completion of Step 2, perform satisfactory electrical testing required after energizing of the electrical system.
  - 3. Complete calibration of instruments.
  - 4. Satisfactorily complete system verification of instrumentation work.
  - 5. After completion of Steps 1 and 3, perform a rotational test of equipment and correct backward rotating drives.

6. After completion of Steps 5 and 6, test operate the equipment by manually initiating the operation. Where manual operation bypasses alarm or safety monitoring, provide continuous supervision of such parameters.
7. Concurrent with Step 7, perform instrumentation and control testing and adjustments as related to the equipment being tested.
8. Concurrent with Step 7, perform adjustments of the electrical work as related to the equipment being tested.
9. Repeat Steps 1 through 8 as required for other equipment items until all equipment systems are ready for total plant operation. It may be necessary for the Contractor to put portions of the newly constructed facility in service before constructing other portions of the facility or completing the Work as a whole.
10. Submit the required documentation of testing, calibration, and equipment affidavits.
11. Notify the Owner and Engineer seven (7) days before total system operation is to begin.
12. 30-Day Plant Startup and Initial Operation Test: Upon completion of all the above steps, the new system shall be started up and operated on a complete full-time basis beginning on the indicated date. The Owner will provide operating personnel, chemicals and untreated water. For five (5) consecutive days beginning with the start-up day, the Contractor shall have at the plant site, during the day shift, an electrician. The Contractor shall also provide manufacturer's representatives, on a 24 hour per day, "on call" basis, if necessary, to adjust, repair, and correct deficiencies as required to keep the facilities in continuous operation for a period of 30 calendar days. The Contractor shall train the operators in the proper operation and the control of the new facilities. The Contractor shall also furnish all such mechanical and electrical workers as required to make adjustments to and perform all required maintenance for the operating equipment until the end of the 30-day initial operation period. Maintenance of operating equipment shall include lubrication, adjustments, replacements, and modifications as required.
13. After successful completion of the 30-day initial operation period, the Owner will take over maintenance duties as well as operation and will begin to provide and pay for lubricants. If continuous process operation is interrupted for a period of four (4) consecutive hours or more due to a failure of the equipment or work provided by the Contractor, then the counting of the 5-day and/or 30-day periods, described in Step 12 above, shall be restarted at day one if these periods have not reached satisfactory completion.
14. Following the commencement of Step 12, satisfactorily complete equipment performance testing, electrical testing and adjustments, and instrumentation/control testing and adjustments to the extent that such testing and adjustments could not be made prior to full system operation.
15. Submit any remaining documentation of testing, balancing reports, equipment affidavits, and the like commissioning before acceptance.

#### 1.04 MANUFACTURER'S FIELD SERVICE AND AFFIDAVITS

- A. Field Service: Where specified, manufacturers of equipment shall provide field service. Field service shall be provided by an authorized factory-trained and qualified manufacturer's representative for the specific equipment. Equipment shall not be considered ready for full-time operation until after the manufacturer's representative has checked and adjusted the equipment, and certified by written

affidavit that the equipment has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full-time operation.

- B. Affidavits: Acceptable affidavits shall be submitted prior to completion of the work.
  - 1. Affidavits shall contain the following specific wording:  
"The Motor Control Center has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full-time operation. The installation has been inspected and has been found to be in conformance with our (the manufacturer's) standards and requirements."
  - 2. Except for insertion of the equipment name, no amplification, dilution, or modification of this specific wording will be permitted.

#### 1.05 TRAINING

- A. Submit Operation and Maintenance Manuals and Parts Lists specified in Section 01300 at least fifteen (15) days prior to the first training session.
- B. Demonstrate the operation, maintenance and safety procedures for all systems and equipment to personnel designated by the Owner.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

- A. Reference Division 16 Electrical for additional commissioning, testing, and startup requirements.

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## SECTION 01700

### CONTRACT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 FINAL CLEANUP

- A. Just prior to Final Inspection, the Contractor shall clean the entire construction area including buildings, other structures, landscaping, and site work included in this Contract as well as all other areas affected by the performance of work under this Contract. Perform cleanup work using personnel specializing in and skilled in building cleaning and maintenance work. Perform cleaning to standards considered normal for commercial janitorial work. Accomplish repair work using personnel specializing in performing and repairing the type of work being repaired. Perform repair work to the highest trade standards applicable to that type of work. Include:
1. Remove all temporary construction, signs, tools, equipment, excess materials and debris.
  2. Sweep clean and then wash down all exterior pavement surfaces. Avoid washing sediment or hazardous material into drainage systems. Remove all grease and oil stains on pavement caused by Contractor's equipment.
  3. Remove all lumps, splatters, spots and stains caused by paint, adhesive, asphalt, concrete, mortar, plaster, sealant or other foreign material from all exposed or finished surfaces. Remove all temporary labels.
  4. Patch any holes, chips or defects in construction including finished surfaces.
  5. Touchup painted surfaces that are soiled, chipped, spotted or otherwise flawed.
  6. Remove all dust with treated dust cloth and vacuum.
  7. Polish all hardware and non-ferrous metal.

##### 1.02 CONTRACTOR'S ACTION LIST OF ITEMS TO BE CORRECTED AND/OR COMPLETED

- A. During construction, the Contractor shall maintain an action list of items to be corrected and/or completed. Regularly add items and update the list as information becomes available or as requested by the Engineer. Deliver a current copy of the list to the Engineer at each progress meeting.

##### 1.03 SEMIFINAL INSPECTION/SUBSTANTIAL COMPLETION

- A. See General Conditions, paragraphs 13.7 through 13.9. When the Contractor considers the Work nearly complete, the Contractor shall review the Contract Documents, inspect the Work, and use the Contractor's action list to prepare a Contractor's Punch List of all deficient or uncompleted items. Complete or correct the items on the Punch List. When the Work is Substantially Complete in accordance with General Conditions, paragraph 13.7, notify the Engineer in writing that the Contractor has reviewed the Contract Documents, inspected the Work and believes that the Work is Substantially Complete and ready for Semifinal Inspection.
- B. See General Conditions, paragraphs 13.9 through 13.10. On receipt of the Contractor's Punch List and notice that the work is ready for Semifinal Inspection, the Engineer will inspect the Work. The Engineer may add additional items to the

Contractor's Punch List, may find that the Work is not ready for inspection, may find that the Work is ready for inspection but not Substantially Complete or may find that the Work is Substantially Complete. When the Engineer finds the Work is Substantially Complete, he/she will prepare a Final Punch List and a notice of Substantial Complete, which will state the date of Substantial Completion and the time agreed to by the Owner and the Contractor (not to exceed 30 calendar days) in which the Work shall be fully complete and ready for Final Inspection.

#### 1.04 FINAL INSPECTION, FINAL COMPLETION AND FINAL PAYMENT

- A. See General Conditions paragraphs 13.11 through 13.15. When the Contractor has completed or corrected all the items on the Engineer's Final Punch List, the Contractor shall give the Engineer written notice that the Work is ready for Final Inspection. When the Engineer finds the Work acceptable and fully complete in accordance with the Contract Documents, and upon receipt of a final Application for Payment and all final submittals, the Engineer will recommend that the Owner issue a Notice of Final Completion, make Final Payment and Accept the Work stating that to the best of the Engineer's knowledge, information and belief, and on the basis of the Engineer's observations and inspection, the Work has been fully completed in accordance with the terms and conditions of the Contract Documents.
- B. Final Submittals include:
  - 1. Operation and Maintenance Manuals and Parts Lists
  - 2. Record Drawings
  - 3. Extra Materials
  - 4. Special Guarantees
  - 5. Maintenance Contracts
  - 6. Insurance Certificate showing required continuation of coverage beyond Final Payment. See General Conditions, paragraph 4.4.
  - 7. Release of Liens. See General Conditions, paragraphs 13.2 and 13.13.
  - 8. Waiver of Claims by Contractor. See General Conditions, paragraph 13.14.
  - 9. And any other submittals required by the Contract Documents and not previously received.
- C. The Owner will record the Notice of Final Completion at the County Recorders Office.

#### 1.05 RECORD DRAWINGS

- A. The Contractor shall maintain on the jobsite, a complete set of Contract Documents and a complete file of all addenda, contract modifications and favorably reviewed submittals. The Contractor shall prepare a set of Record Drawings concurrently with the construction of the Work and in accordance with General Conditions, paragraph 5.13 and the following:
  - 1. Comply with detailed requirements in technical specification sections describing the type of information required on Record Drawings. The Contractor's copy of Contract Documents, Contract modifications and Record Drawings shall be available to the Engineer for weekly verification that the records are being currently updated.
- B. Submit Record Drawings and obtain acceptance prior to completion.

1.06 EXTRA MATERIALS

- A. Deliver specified extra materials and parts to Owner. Itemize all items on a transmittal letter in duplicate and obtain signature of receiving party. Submit copies of signed transmittals for all specified extra materials and parts prior to completion.

1.07 SPECIAL GUARANTEES

- A. Paragraph 12.11 of the General Conditions covers the Contractor's responsibility to remedy defects due to faulty workmanship and materials, which appear within one (1) year from the date of Final Completion and acceptance by the Owner.
- B. Guarantees for more than one (1) year when called for in various sections of the Specifications shall be evidenced by the Contract Documents and in the form of a special guarantee written on the letterhead of the Contractor, subcontractor, or supplier doing the work and/or supplying the item to be guaranteed and countersigned by the Contractor as follows. Failure to provide the special guarantee on the letterhead shall not relieve the Contractor, subcontractor, or supplier from its obligations for the special guarantees.

C. Special Guarantee:

We hereby guarantee that the \_\_\_\_\_ which we have provided in the \_\_\_\_\_, Project, was done in accordance with the Drawings and Specifications, and that the work, as installed, will fulfill the requirements of the guarantee included in Specification Section \_\_\_\_\_. We agree to repair or replace any or all of our work, together with any other adjacent work which may be damaged or displaced by so doing, that may prove to be defective in workmanship or material (with the exception of defects due to ordinary wear and tear, and unusual abuse or neglect) within a period of \_\_\_\_\_ years from the date of acceptance of the abovenamed facility, without any expense whatsoever to the Owner. In the event of our failure to comply with the above-mentioned conditions within the period set forth in Article 12 of the General Conditions after being notified in writing by the Owner, we, collectively or separately, do hereby authorize the Owner to proceed to have said defects repaired and made good at our expense, and we will honor and pay the costs and charges therefore upon demand. We understand that the provisions of General Conditions paragraphs 12.15 and 12.16 apply to this Special Guarantee.

Signed \_\_\_\_\_  
(Subcontractor or Supplier)

Company \_\_\_\_\_

Address \_\_\_\_\_

Telephone Number \_\_\_\_\_

Countersigned \_\_\_\_\_  
(Contractor)

- D. Submit two (2) notarized original signed copies of each required Special Guarantee prior to completion.

1.08 TWELVE-MONTH INSPECTION

- A. Thirty (30) days prior to the expiration of the one-year guarantee period described in General Conditions, Article 12, the Contractor shall tour the project with the Engineer and/or the Owner to prepare a list of corrective work required under the one-year guarantee. The Contractor shall correct all items found to be defective within 20 days of receipt of the list of items to be corrected.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 16010

### GENERAL ELECTRICAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Work Included:
  - 1. Provide all required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, and test equipment, and satisfactorily complete all electrical work shown on the Drawings, included in these Specifications, or required for a complete and fully operating facility.
  - 2. Provide conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished.
- B. Safety: Conduct operations in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workspaces.

##### 1.02 CODE COMPLIANCE AND REFERENCE STANDARDS

- A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:
  - 1. National Electrical Safety Code (NESC)
  - 2. Occupational Safety and Health Administration (OSHA)
  - 3. National Fire Protection Association (NFPA)
  - 4. National Electrical Manufacturers Association (NEMA)
  - 5. American National Standards Institute (ANSI)
  - 6. Insulated Cable Engineers Association (ICEA)
  - 7. Instrument Society of America (ISA)
  - 8. Underwriters Laboratories (UL)
  - 9. Factory Mutual (FM)
  - 10. Institute of Electrical and Electronics Engineers
  - 11. American Society of Testing Materials (ASTM)
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- C. All materials and equipment for which a UL standard exists, shall bear a UL label. No such material or equipment shall be brought onsite without a UL label affixed.
- D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Owner/Engineer.
- E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase

in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times.

### 1.03 SUBMITTALS

- A. Shop Drawings shall be custom prepared for this project and submitted as listed in each of the Electrical Specification Sections. Shop drawings shall include the following:
1. Complete materials list stating manufacturer, brand name and catalog number of each item or class of material.
  2. For equipment, panels, boxes, control devices, wiring devices, and other uniquely-tagged items as indicated on the Drawings, include the respective tag(s) on each applicable shop drawing and cut sheet.
  3. Shop drawings for grounding work not specifically indicated on the drawings but required under the NEC.
  4. Front, side and rear elevations along with top views with required dimensional data.
  5. Location of conduit entrances and access plates.
  6. Catalog cuts defining component data.
  7. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size and cable numbers.
  8. Method of anchoring, seismic requirements and weight.
  9. Types of materials and finish.
  10. Nameplates.
  11. Temperature limitations, as applicable.
  12. Voltage requirements, phase and current, as applicable.
  13. Front and rear access requirements.
  14. Test reports.
- B. O&M Manuals and other documentation, shall be submitted in accordance with these contract documents. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc. to instruct operating and maintenance personnel unfamiliar with such equipment. All manuals and other documentation shall be submitted as listed in each of the Electrical Specification Sections and include the following:
1. A comprehensive index.
  2. A complete "As-built" set of approved shop drawings.
  3. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.
  4. A table listing of the "as left" settings for all timing relays and alarm and trip set points.
  5. System schematic drawings "As-Built", illustrating all components, piping and electrical connections of the system supplied under this Section.
  6. Detailed service, maintenance and operation instructions for each item supplied.
  7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
  8. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
  9. Complete parts list with stock numbers, including spare parts.

- C. Record Drawings shall be promptly furnished when the equipment installation is complete. Payment may be withheld until Record Drawings have been furnished and approved.
- D. At the time of delivery of the equipment, the Contractor shall have an approved shop drawing in his possession for the Owner's Inspector and/or Owner's Engineer for verification.
- E. As-Built Drawings: As the work progresses, legibly record all field changes on a set of Project Contract Drawings, hereinafter called "As-Built Drawings". The As-Built Drawings and specifications shall be kept up to date throughout the project. As-Built Drawings shall accurately show the installed condition of the following items at a minimum:
  - 1. One-line Diagram(s).
  - 2. Raceways and pullboxes.
  - 3. Conductor sizes and conduit fills.
  - 4. Panelboard Schedule(s).
  - 5. Control Wiring Diagram(s).
  - 6. Luminaire Schedule(s)
  - 7. Luminaire, receptacle and switch outlet locations.
  - 8. Underground raceway and duct bank routing including manhole/handhole locations.
  - 9. Plan view, sizes and locations of switchgear, switchboards, distribution transformers, motor control centers and panelboards.

#### 1.04 TESTS

- A. The Contractor shall be responsible for factory and field tests indicated in Division 16, as required by the Engineer and as required by other authorities having jurisdiction.
- B. Furnish necessary testing equipment
- C. Pay the costs of the tests, including replacement parts and labor due to damage resulting from damaged equipment or from testing and correction of a faulty installation.
- D. Reporting
  - 1. Where test reporting is indicated, submit proof-of-design test reports for mass-produced equipment with the Shop Drawings.
  - 2. Submit factory performance test reports for custom-manufactured equipment for approval prior to shipment.
  - 3. Submit field test reports for review prior to Substantial Completion.
- E. Remove and replace equipment or material that fails a test, or, if the Engineer approves, repair and retest for compliance.
- F. Connections to equipment or materials with a factory warranty shall be as recommended by the manufacturer and shall be performed in a manner that does not void the warranty.

#### 1.05 PERMITS AND INSPECTIONS

- A. Obtain permits and pay all fees required for permits inspections.
- B. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.

- C. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.
- D. Favorable review of the equipment at the factory only allows the manufacturer to ship the equipment to the project site. The Contractor shall be responsible for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

#### 1.06 DEMOLITION AND RELATED WORK

- A. General
  - 1. Perform electrical demolition work as indicated.
  - 2. Coordinate with all trades regarding electrical de-energization, disconnection and removal, and the overall sequence of construction.
- B. Electrical Requirements for Removed Equipment
  - 1. Remove dedicated wiring and exposed conduits back to the source.
  - 2. Where control wiring to be demolished shares a conduit with other wiring to remain, the control wiring shall be abandoned in place. Where power wiring to be demolished shares a conduit with other wiring to remain, the power wiring shall be removed.
  - 3. Remove power wiring from the power source to the first pullbox or manhole remote from the panel and abandon in place the remaining wiring.
  - 4. Abandon in place wiring routed through encased conduits and cut encased conduits flush to the floor and grout flush with the floor.
  - 5. Remove remote mounted starters, disconnect switches, circuit breakers, sensors and transmitters
- C. Where new lighting and receptacles are installed in existing structures, remove old lighting, receptacles, switches, wiring and conduits.
- D. Junction Boxes
  - 1. Wiring and conduits indicated to be extended shall be terminated in a new junction box with terminal strips.
  - 2. Provide a junction box with a NEMA rating in accordance with the area in which it is located and sized as required by the NEC.
  - 3. Properly identify wires and terminals before disconnection.
- E. Removed materials and equipment shall, upon removal, become the Contractors property and shall be disposed of off-site.
- F. Identification
  - 1. Where switchgear, motor control centers, switchboards or panelboards are indicated to have components, assemblies or circuits removed and/or reconnected, provide the affected equipment compartments with new engraved nameplates matching the existing. Modify panelboard schedule(s) to indicate revised circuits.
  - 2. Pencil or magic marker markings directly on equipment will not be acceptable.

#### 1.07 COORDINATION

- A. Coordinate the electrical work with the other trades, code authorities, utilities, and the Owner.



- B. Where connections must be made to existing installations, properly schedule all the required work with the Owner, including the power shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the plant and privately owned facilities.
- C. Submit a written sequencing request indicating the sequence and duration of activities to be performed during the plant shutdown. The maximum acceptable shutdown duration shall be one month, and shall occur from March 1 through March 31.
- D. Switching, safety tagging and other project related tasks required for shutdown or to isolate existing equipment, shall be performed by the Contractor.
- E. In no case shall the Contractor begin any work in, on or adjacent to existing equipment without written authorization from the Engineer.
- F. Modifications
  - 1. Perform modifications or alterations to existing electrical facilities as required to successfully install and integrate the proposed electrical equipment as indicated.
  - 2. Perform modifications to existing equipment, panels and cabinets in a professional manner. Repair coatings of existing equipment to match existing
  - 3. The costs for modifications to existing electrical facilities that are required for a complete and operable system shall be included as part of the Work.
- G. Existing Utilities
  - 1. Exercise extreme caution when digging trenches to not damage existing underground utilities.
  - 2. The cost of repairs of damages caused during construction shall be included as a part of the Work.
- H. Field Verifications
  - 1. Visit the site before submitting a Bid to become better acquainted with the Work of this Contract. Visits must be scheduled and coordinated with the Owner at least 48 hours in advance. Contact Lewis Giambruno, Operations Manager (209-586-4988 / [lgiambruno@twainhartecsd.com](mailto:lgiambruno@twainhartecsd.com)).
  - 2. The lack of knowledge will not be accepted as justification for extra compensation to perform the Work.
  - 3. The Contractor shall be responsible for identifying available existing circuit breakers in lighting panel for the intended use as required.
  - 4. The Contractor shall be responsible for field verifying the available space in switchgear, switchboards and/or motor control centers to integrate new overcurrent protective devices meeting the requirements of these Specifications.
  - 5. The cost for the above field verifications shall be included as part of the Work.
- I. Installation of Temporary Power
  - 1. To facilitate the continuous operation of existing equipment, provide a temporary alternate source of power for specific critical circuits as indicated on the drawings.
  - 2. Submit installation and connection details for favorable review and acceptance by the Engineer.
  - 3. Costs associated with these temporary installations shall be included as part of the Work.
  - 4. Temporary wiring and equipment shall remain the property of the Contractor unless indicated otherwise.

## 1.08 LOCATIONS

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located, as defined in Paragraph B. herein.
- B. Definitions of Types of Locations:
  - 1. Dry Locations: All those indoor areas which do not fall within the definitions below for Wet, Damp, Hazardous, or Corrosive Locations and which are not otherwise designated on the Drawings.
  - 2. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.
  - 3. Damp Locations: All spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank, unless otherwise designated on the Drawings.
  - 4. Corrosive Locations: Areas where chlorine or sulfur dioxide gas under pressure, sulfuric acid, or liquid polymer are stored or processed. These areas are shown on the Drawings.
- C. Unless otherwise specified herein or shown on the Drawings, electrical enclosures and associated installations shall have the following ratings:
  - 1. NEMA 1 gasketed or 12 for dry, non-process indoor above grade locations
  - 2. NEMA 3R for outdoor installations identified not to be hazardous or corrosive.
  - 3. NEMA 4X enclosures of Type 304 or 316 stainless steel in corrosive areas except in chlorine and HFS areas where non-metallic enclosures shall be provided.
- D. Equipment and materials installed in areas designated as hazardous on the Drawings shall be UL Listed for the appropriate hazardous area classification.

## 1.09 PHASE BALANCING

- A. The Drawings do not attempt to balance the electrical loads across the phases. Circuits on motor control centers and panelboards shall be field connected to result in evenly distributed loads across all three phases.
- B. Field balancing of circuits shall not alter the conductor color coding requirements defined in Section 16120.

## 1.10 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.
- B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure the tilting does not impair the functional integrity of the equipment.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of

other manufacturers provided they are favorably reviewed by the Engineer prior to installation.

- B. It is the intent of these Specifications and Drawings to secure high quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses, which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed, braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.
- C. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble-free service. Light-duty, fragile and competitive grade devices of doubtful durability shall not be used.
- D. Where a NEMA enclosure type is indicated in a non-hazardous location, use that type of enclosure despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.
- E. Temperature Ratings of Equipment Terminations and lugs shall be rated for use with 75-degree C conductors. Wire sizes in the Contract Documents are based on NEC ampacity tables using the 75-degree C ratings.

## 2.02 MOUNTING HARDWARE

- A. Miscellaneous Hardware threaded galvanized steel, 3/8-inch diameter minimum.
  - 1. Provide nuts, bolts and washers constructed of stainless steel.
  - 2. Provide threaded rods for trapeze supports constructed from continuous
  - 3. Slotted channel
    - a. Construct struts for mounting of conduits and equipment of galvanized steel.
    - b. Where contact with concrete or dissimilar metals may cause galvanic corrosion, use suitable non-metallic insulators in order to prevent such corrosion.
    - c. Slotted channel manufacturer shall be Unistrut, B-Line or approved equal.
  - 4. Provide plastic protective end caps for all exposed slotted channel ends. End caps shall be manufactured by Unistrut P2860-33 or approved equal
  - 5. Provide stainless steel expansion anchors for attaching equipment to concrete walls, floors and ceilings. Expansion anchors shall be manufactured by Power Fasteners, Inc and be the "Power-Bolt" or "Power-Stud" series or approved equal.

## 2.03 LENS COLOR SCHEME

- A. Indicating light lens colors shall be green for "Run", "Open" or "On"; red for "Stop", "Close" or "Off"; and amber for alarm.

## 2.04 NAMEPLATES

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings and the model designation.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using fasteners constructed of brass, cadmium plated steel or stainless steel and screwed into inserts or tapped holes as required. Where no inscription is indicated on the Drawings, furnish nameplates with an appropriate inscription furnished by the Engineer upon prior request by the Contractor.
- C. Provide engraved characters of the block style, with no characters smaller than 1/8 inch top to bottom.
- D. Each control device, including pushbuttons, control switches, and indicating lights, shall have an integral legend plate or nameplate indicating the device function. These shall be inscribed as indicated on the Drawings or as favorably reviewed by the Engineer.

## 2.05 PAINTING

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish, which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.

## PART 3 - EXECUTION

### 3.01 REQUIREMENTS

- A. All electrical installations shall conform to the codes and standards outlined in this Section.

### 3.02 WORKMANSHIP

- A. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
- B. Perform all labor using qualified craftsmen, who have had experience on similar projects. Provide first-class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improperly fit installations at no additional expense to the Owner.
- E. Provide materials and incidentals required for a complete and operable system, even if not required explicitly by the Contract Documents.
- F. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

### 3.03 CONDUCTOR IDENTIFICATION

- A. Identify all wires and cables in conformance with the requirements of Section 16120. This requirement applies to all equipment provided under this contract, as well as to all conductors provided or worked on during this contract.

### 3.04 CUTTING, DRILLING, AND WELDING

- A. Provide any cutting, drilling, and welding that is required for the electrical construction work.
- B. Structural members shall not be cut or drilled, except when favorably reviewed by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.
- C. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel.
- D. Perform patch work with the same materials as the surrounding area and finish to match.

### 3.05 METAL PANELS

- A. Mount all metal panels which are mounted on or abutting concrete walls in damp locations or any outside walls 1/4 inch from the wall, and paint the back sides of the panels with a high build epoxy primer. Film thickness shall be 10 mils minimum.

### 3.06 PROTECTIVE DEVICE COORDINATION

- A. Perform power system studies and provide protective device coordination in accordance with Section 16961.

### 3.07 TESTING

- A. Perform acceptance testing in accordance with Section 16950.
- B. Perform additional testing as indicated within specific equipment sections.

### 3.08 EQUIPMENT STORAGE AND PROTECTION

- A. During construction, provide adequate storage for all equipment and materials that will become part of the completed facility so that it is protected from weather, dust, water, and other environmental impacts, or damage from construction operations.
- B. Store and protect products in accordance with manufacturer's instructions. Seals and labels shall be intact and legible.
- C. Store moisture sensitive products including electrical equipment, instruments and controls in weathertight, humidity and temperature-controlled enclosures to avoid condensation and dust buildup.
- D. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- E. Exercise care at all times after installation of equipment, motor control centers, etc., to keep out foreign matter, dust, dirt, debris, or moisture. Use protective sheet-metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

### 3.09 CLEANING EQUIPMENT

- A. Before final acceptance, thoroughly clean the electrical Work of cement, plaster and other materials.
- B. Clean out and vacuum all construction debris from the bottom of all equipment.
- C. Provide and touch-up to original condition any factory painting that has been marred or scratched during shipment or installation, using paint furnished by the equipment manufacturer.
- D. Remove temporary tags, markers, stickers and the like.
- E. Remove all oil and grease spots with a non-flammable cleaning solvent by carefully wiping and scraping cracks and corners.
- F. Clean luminaires inside and out.
- G. Dispose of cleaning debris and refuse off-site.

END OF SECTION

## SECTION 16110

### ELECTRICAL RACEWAY SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish and install complete raceway systems as shown on the drawings and as specified herein.
- B. Raceways and conductors that are listed on the conduit and cable schedules are generally not shown on the Drawings, except where they are required to pass through a restricted or designated space and the Contractor would benefit from additional information. Conduit block diagrams indicate exposed conduits as solid lines and shall be run near the ceilings or along walls of the areas through which they pass and shall be routed to avoid interferences with HVAC ducts, cranes and hoists, lighting fixtures, doors and hatches, etc. Conduit block diagrams indicate concealed or buried conduits as dashed lines and shall be run in underground duct banks, center of concrete floor slabs, in partitions, or above hung ceilings as required.
- C. In the event that individual equipment loads provided are larger than indicated in the Contract Documents, revise raceways, conductors, starters, overload elements, and branch circuit protectors as necessary in order to control and protect the increased connected load in conformance to NEC requirements as part of the WORK.

##### 1.02 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI) Publications:
  - 1. C80.1 Specification for Zinc Coated Rigid Steel Conduit
  - 2. C80.5 Specifications for Rigid Aluminum Conduit
- B. Federal Specifications (FS):
  - 1. FS W C 1094 W C 1094A Conduit and Conduit Fittings, Plastic, Rigid
  - 2. FS WW C 540 WW C 540A Conduit, Metal, Rigid, (Electrical, Aluminum)
  - 3. WW C 540C Conduit, Metal, Rigid & Coupling, Elbow & Nipple, Electrical Conduit, Aluminum
  - 4. FS WW C 566 WW C 566C Flexible Metal Conduit
- C. National Electrical Manufacturers Association (NEMA) Publications:
  - 1. RN 1 Polyvinyl Chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing
  - 2. TC2 Electrical Polyvinyl Chloride (PVC) Conduit
  - 3. TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation
  - 4. TC14 Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
- D. Underwriters Laboratories (UL) Standards:
  - 1. 6 Rigid Metal Electrical Conduit
  - 2. 6A Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless Steel
  - 3. 360 Liquid-Tight Flexible Metal Conduit
  - 4. 651 Electrical Rigid Nonmetallic Conduit and Fittings
  - 5. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

## 6. 2515 Aboveground Reinforced Thermosetting Resin Conduit

### 1.03 SUBMITTALS

- A. Submit complete catalog cuts of raceways, fittings, boxes, supports, and mounting hardware, marked where applicable to show proposed materials and finishes.
- B. Prepare as-built drawings of encased concealed and exposed raceways, ducts, raceways, junction boxes, pull boxes, and electrical and instrumentation equipment.

### 1.04 LOCATIONS

- A. Refer to Section 16010 for definitions of types of locations.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Pull and junction boxes, fittings and other indicated enclosures that are dedicated to the raceway system shall comply with the requirements of this Section.
- B. Provide exposed conduit of 3/4-inch minimum trade size and encased conduit of 1-inch minimum trade size.
- C. The use of short sections of 1/2-inch flexible conduit for final termination of field control devices and instrumentation is permitted. They may not be longer than 36 inches in length, and may only transition to the smaller size junction boxes or condulets at the field device.

### 2.02 CONDUIT RACEWAYS

- A. Galvanized Rigid Steel Conduit (GRS) shall be manufactured from mild steel, hot-dip galvanized inside and out, conforming to ANSI C80.1 and UL 6. Couplings shall be threaded type. Manufacturers shall be Allied Tube and Conduit, Wheatland Tube or approved equal.
- B. Rigid Aluminum Conduit: Conduit shall be manufactured from 6063 alloy, temper T-1 and conform to FS WW C 540 OR ANSI C80.5 and UL-6A. Manufacturers shall be Allied Tube and Conduit, American Conduit OR approved equal.
- C. PVC coated rigid steel conduit (PGRS) shall meet the requirements of GRS above. A PVC coating shall be bonded to the outer surface with a thickness not less than 40 mils. The inside surfaces and threads of the conduit shall be provided with a 2-mil urethane coating. PGRS shall be manufactured in accordance with UL-6, ANSO C80.1 and NEMA RN1. Manufacturers shall be Robroy Industries Perma-Cote or Plasti-Bond series, Thomas & Betts Ocal Blue or approved equal.
- D. Liquidtight Flexible Conduit shall be constructed of a flexible galvanized metal core with a sunlight-resistant thermoplastic outer jacket. Conduit shall be manufactured in accordance with UL 360. Flexible conduit in hazardous areas shall be rated for the Class, Division and Group in which its installed. Manufacturers shall be Anaconda Sealtite, Electriflex Liqueatite or approved equal.
- E. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be PVC Schedule 40 (PVC 40) or PVC Schedule 80 (PVC 80) and sunlight resistant. Conduit shall be



approved for underground use and for use with 90°C wires, and shall conform to NEMA TC-2 and UL 651. Manufacturers shall be Carlon, Cantex or approved equal.

- F. Fiberglass conduit shall be manufactured using the single circuit filament winding process. The resin shall be epoxy-based, with no fillers. All additives for increasing flame spread and lowering smoke density shall be halogen free. Conduit shall be manufactured in accordance with NEMA TC 14. Manufacturers shall be Champion Fiberglass, United Fiberglass or approved equal.

## 2.03 CONDUIT SUPPORTS

- A. For indoor, dry locations, supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer. All other locations shall be Type 316 stainless steel.
- B. For indoor, dry locations, supports for multiple conduits shall be hot-dip galvanized Unistrut or Superstrut channels, or equal. All associated hardware shall be hot-dip galvanized. All other locations shall be Type 316 stainless steel.
- C. All channels, strut, threaded rods, nuts and clamps in corrosive areas shall be of epoxy resin reinforced fiberglass material. Provide Robroy, Superstrut, or equal.

## 2.04 FITTINGS

- A. General
  - 1. For use with metallic conduit, provide cast and malleable iron fittings of the threaded type with 5 full threads.
  - 2. Fittings
    - a. Provide fittings with neoprene gaskets and non-magnetic stainless steel screws.
    - b. Attach covers by means of holes tapped into the body of the fittings.
    - c. Covers for fittings attached by means of clips or clamps will not be accepted.
  - 3. Terminations
    - a. In outdoor areas, terminate conduit in rain-tight hubs as manufactured by Myers, O.Z. Gedney, Appleton or approved equal.
    - b. In other than outdoor areas, provide sealed locknuts and bushings.
- B. Fittings for use with rigid steel shall be hot dipped galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse-Hinds Condulets, Appleton Unilets, or equal. Provide threaded-type couplings and connectors; set-screw type and compression-type are not acceptable.
- C. Fittings for use with aluminum shall be cast aluminum with less than 0.40 percent copper content, and suitable for use with aluminum conduit. Manufacturers shall be O.Z. Gedney, Appleton, Crouse-Hinds or approved equal.
- D. Fittings for use with PVC-coated GRS conduit shall be PVC-coated that are the products of the same manufacturer as the conduit. Both male and female threads and internal surfaces shall contain a 2-mil urethane coating.
- E. Fittings for use with rigid nonmetallic conduit shall be PVC and have solvent-weld-type conduit connections. Boxes shall be manufactured of PVC or fiberglass reinforced polyester (FRP). Manufacturers shall be Carlon, Crouse-Hinds, Hoffman or approved equal. If such are not available, then the Specification for PVC coated galvanized rigid steel fittings shall apply.

- F. Fittings for flexible conduit shall be Appleton Type ST, O.Z. Gedney Series 4Q, or approved equal.
- G. Fittings for use with fiberglass conduit shall be fiberglass and as recommended by the conduit manufacturer.
- H. Combination expansion-deflection fittings with internal grounding shall be installed where conduit movement is expected in more than one dimension, and where conduits transition out of structures in locations where differential settlement may occur. Combination expansion/deflection fittings shall be manufactured by Crouse-Hinds Type XJGD or approved equal.
- I. Expansion fittings with internal grounding shall be installed wherever exposed raceway cross building expansion joints. Expansion fittings shall be Crouse Hinds Type XLGSA or approved equal.
- J. Union couplings for conduits shall be the Erickson type and shall be Appleton Type EC, O.Z. Gedney 3-piece Series 4, or approved equal. Threadless couplings shall not be used.
- K. Bushings:
  - 1. Bushings shall be the insulated type.
  - 2. Bushings for rigid steel conduit shall be hot dip galvanized insulated grounding type, O.Z. Gedney Type HBLG, Appleton Type GIB, or approved equal.
- L. Conduit seals in hazardous areas shall have zinc electroplate and shall be Crouse-Hinds Type EYS or EZS; Appleton Type EYS, ESU, or EY series; or approved equal.
- M. Conduit seals in areas where chlorine, ammonia, sulfur dioxide and/or hydrofluosilicic areas shall be Link Seal or approved equal.

## 2.05 BOXES

- A. Boxes specified herein are for use with raceway systems only. Boxes used for housing electrical and instrumentation equipment shall be as described elsewhere in these Specifications.
- B. NEMA 1 Areas: NEMA 1 terminal boxes, junction boxes, pull boxes, etc. shall be either sheet or cast malleable iron or aluminum depending on raceway material. Boxes shall be suitable for wall mounting or have feet where self-standing. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. All boxes shall have hinged gasketed doors with quarter turn latches or 3-point latch (single operator) system on enclosures larger than 36 inches wide or 32 inches tall. Terminal boxes shall be furnished with terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V. Boxes shall be Concept Series as manufactured by Hoffman Engineering Co. or approved equal.
- C. NEMA 4X Areas: NEMA 4X terminal boxes, junction boxes, pull boxes, etc. shall be Type 304 or 316 stainless steel. Boxes shall be suitable for wall mounting or have feet where self-standing. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers

shall not be less than 12 gauge metal. All boxes shall have hinged gasketed doors with quarter turn latches or 3-point latch (single operator) system on enclosures larger than 36 inches wide or 32 inches tall. Terminal boxes shall be furnished with terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V. Boxes shall be Concept Series as manufactured by Hoffman Engineering Co. or approved equal.

- D. Boxes for use in chemically corrosive areas shall be of rigid PVC. Construction shall be the same as specified for NEMA 4X areas as specified above.

## 2.06 WIREWAYS AND AUXILIARY GUTTERS

- A. General: Wireways shall consist of a prefabricated channel-shaped trough with hinged or removable covers, associated fittings, and supports. Straight sections shall not be longer than 5 feet. Separate power, control, signal and communications cables by grounded metallic dividers in wireways or run in separate wireways. Cross-sectional dimensions shall be as indicated on the Drawings. Fittings shall consist of elbows, tees, crosses, and closing plates as required.
- B. Interior Locations: All components shall be constructed from sheet steel not less than 14 gauge and coated with a corrosion-resistant gray paint. Covers shall be held closed with hinges and clamps.
- C. Exterior Locations: Wireway and associated fittings shall be NEMA rated for the area in which it is to be installed. Wireways shall be supplied with gasketed closing end plates and gasketed hinged covers.
- D. Corrosive Locations: In corrosive locations provide enclosure type boxes for use as wireways. Enclosures and associated fittings shall meet NEMA 4X classifications and shall be manufactured from reinforced injection molded fiberglass or formed and welded stainless steel and shall have gasketed closing plates and hinged and gasketed covers with spring loaded latches.
- E. Ground the steel and aluminum wireway bodies. Provide steel dividers with steel wireways or aluminum dividers with aluminum wireways, and ground by means of an individual grounding conductor.
- F. Terminate conduits in all wet and damp locations with rain-tight hubs as manufactured by O.Z. Gedney, Myers or approved equal. In finished areas, provide sealed locknuts and bushings.

## 2.07 CONDUIT SEALANTS

- A. Moisture Barrier Types: Sealant shall be a non-toxic, non-shrink, non-hardening, putty type hand applied material providing an effective barrier under submerged conditions.
- B. Fire Retardant Types: Fire stop material shall be a reusable, non-toxic, asbestos-free, expanding, putty type material with a 3 hour rating in accordance with UL 1479. Provide products indicated by the manufacturer to be suitable for the type and size of penetration.

## PART 3 - EXECUTION

### 3.01 CONDUIT, RACEWAY AND FITTING INSTALLATION

- A. No wire shall be pulled until the raceway system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the raceway system has been completed in every detail.
- B. From pull point to pull point, the sum of the angles of all of the bends and offsets shall not exceed 270 degrees.
- C. Coat threads with a conductive lubricant before assembly.
- D. Provide joints that are tight, thoroughly grounded, secure and free of obstructions by use of a mandrel. Adequately ream the conduit in order to prevent damage to the wires and cables inside. Use strap wrenches and vises to install the conduit in order to prevent wrench marks on the conduit. Any conduit with wrench marks shall be replaced.
- E. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction. Duxseal, or 3M seal spray shall be used in all applications. Plugging with tape is prohibited, even for short periods of time.
- F. For power, control and signal circuits, provide conduit per Conduit Use Tables below, unless specifically indicated otherwise on the Drawings:
  - 1. Exception: For raceways leaving a building above grade and then going below grade, provide PVC-coated GRS from a point 3 feet above grade to a point 5 feet from the building wall.
- G. Unless boxes have cast, threaded hubs, provide insulated type metallic grounding bushings for metallic conduits at all boxes. Bond together all conduits to provide continuity of the equipment grounding system. Size bonding conductor per NEC.
- H. Provide flexible conduit in lengths of not more than 36 inches at connections to motors, valves and any equipment subject to vibration or relative movement. All flexible conduits, regardless of length or manufacturer rating, shall have a dedicated ground bonding conductor pulled through, whether it is included in the conduit fill schedules or not.
- I. Conduits embedded in concrete floors on grade shall be installed between grids of reinforcing steel, or shall be encased below the floors, provided the concrete is thickened in a manner satisfactory to the Engineer. Installation of conduit below the bottom of this slab is not acceptable; embedding or encasing is required.
- J. Damage to PVC coating of coated conduits or fittings shall be repaired with factory-approved PVC patching material to the original factory condition.
- K. Install fiberglass conduit in accordance with the manufacturer's instructions. Connections between sections of conduit may be either glued or threaded, at the Contractor's option.
- L. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits exposed except where the Drawings indicate that they are to be embedded in the floor slab, walls, or ceiling, or to be installed underground.
  - 1. Exposed Conduits:
    - a. Support exposed conduits within 1 foot of any outlet and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits

- fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps. Coordinate conduit locations with piping, equipment, fixtures, and with structural and architectural elements. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel to building lines. No diagonal runs will be accepted. Bends in parallel runs shall be concentric and shall be run straight and true.
- b. Group together exposed conduits in horizontal runs located away from walls and support on trapeze hangers. Arrange such conduits uniformly and neatly. Trapeze hangers shall consist of channels of adequate size, suspended by means of minimum 3/8" diameter rods or other suitable means from the ceiling or from pipe hangers. Install such runs so as not to interfere with the operation of valves or any other equipment, and keep at least 6 inches clear of any pipe which may operate at more than 100°F. Treat cut surfaces or damaged ends with corrosion-resistant coatings such as "Devcon Z", prepared by Subox Coatings; "Galvanox Type I", prepared by Pedley-Knowles; or approved equal. Application shall follow manufacturer's recommendation.
- M. All penetrations through walls into or out of corrosive locations, as defined in Section 16010 shall be made gas-tight. In concrete walls, pour concrete after the conduit is in place, if possible. If not, core drill concrete or CMU walls, install conduit and caulk around it with non-shrink grout. Install conduit seal in each conduit near the penetration.
  - N. All conduit penetrations through interior walls and floors shall be sealed with fire retardant type conduit sealant.
  - O. Conduit Identification: In each handhole, pullbox, cabinet, motor control center or other equipment enclosure, identify each conduit using the conduit number shown on the Drawings by means of a stamped brass tag affixed with stainless steel wire; where affixing a tag is not feasible, identify conduits by affixing a brass tag with epoxy or other approved method of stenciling to the wall or structure adjacent to the conduit terminus.
  - P. Conduit Seals:
    - 1. Moisture Seals: Provide in accordance with NEC Paragraph 300.5(g).
    - 2. Gas Seals: Provide in accordance with NEC Paragraph 501.5.
  - Q. Aluminum conduit shall not be installed underground or encased in concrete. If necessary to run through concrete, install in a non-metallic conduit sleeve or use PVC coated conduit.
  - R. Rigid PVC conduit shall be stored on a flat surface and shielded from the sun.

**CONDUIT USE TABLE 1**

Circuit Type	Inside Buildings						
	Exposed			Concealed			
	Standard	Corrosive	Hazardous	Above Suspended Ceilings	In Stud Walls	Embedded In Concrete	Slab On Grade
Power & 120 Vac Control	GRS or Aluminum**	PVC Coated GRS or Aluminum**	PVC Coated GRS or Aluminum**	PVC-80 or GRS	GRS	PVC-40 or PVC-80	PVC-40 or PVC-80
Signal	GRS or Aluminum**	PVC Coated GRS or Aluminum**	PVC Coated GRS or Aluminum**	GRS	GRS	GRS	GRS

**CONDUIT USE TABLE 2**

Circuit Type	Outside Buildings			Transition
	Exposed	Buried In Soil	Duct Bank Encased In Concrete	Within 5 Feet of Building
Power & 120 Vac Control	PVC Coated GRS, Aluminum** or Fiberglass**	PVC Coated GRS	PVC-40	PVC Coated GRS
Signal	PVC Coated GRS, Aluminum** or Fiberglass**	PVC Coated GRS	GRS	PVC Coated GRS

\* Provide ground wire sized per NEC requirements for all circuits.

\*\* Aluminum and/or Fiberglass may be used in corrosive locations where environmental conditions warrant its use.

Notes:

1. Generally, the Conduit Use Tables apply.
2. Signal circuits are those subject to RF interference or induced current. MSPs, TSPs, telephone cable, coaxial cable, and manufacturer's cables specially designed for low level signals are all presumed to be part of signal circuits.
3. Provide fiberglass conduit where indicated on the Drawings.

### 3.02 WIREWAY INSTALLATION

- A. Straight sections and fittings shall be solidly bolted together to be mechanically rigid and electrically continuous. Dead ends shall be closed. Unused conduit openings shall be plugged.
- B. Wireways shall be supported every 5 feet.
- C. Wireways and auxiliary gutters shall not contain wiring or control devices and shall not extend over 30 feet in length.

END OF SECTION

## SECTION 16120

### LOW VOLTAGE WIRE AND CABLE

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish labor, materials, equipment and incidentals necessary to install wire and cable specified under this Section. Electrical work shall be in accordance with Specification 16010 – General Electrical Requirements.
- B. Work shall include building wire, cable, wiring connections and terminations and modular wiring systems.

##### 1.02 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
  - 1. B3-74 Specification for Soft or Annealed Copper Wire
  - 2. B8-77 Specification for Concentric Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft
  - 3. B173-71 Specification for Rope Lay Stranded Copper Conductors Having Concentric Stranded Members
- B. Insulated Cable Engineers Association (ICEA):
  - 1. S-66-524 Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable
- C. International Electrical Testing Association (NETA);
  - 1. ATS Acceptance Testing Specifications
- D. National Electrical Manufacturers Association
  - 1. WC-3 Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
  - 2. WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- E. Underwriters Laboratories (UL) Standards:
  - 1. 62 Flexible Cords and Fixture Wire
  - 2. 510 Insulating Tape
  - 3. 1063 Stranded Conductors for Machine Tool Wire

##### 1.03 SUBMITTALS

- A. Submit the following material or equipment data:
  - 1. Each type of cable and wire to be used.
  - 2. Cable and wire splices
  - 3. Wire markers

##### 1.04 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall protect all cable and wire from being damaged at all times.
- B. Cable ends shall be protected from water entry in accordance with the manufacturer's recommended procedures. Cable ends shall not be left open in manholes or other locations subject to submergence. If the cable ends become

submerged prior to splicing or termination, the cables shall be replaced in their entirety.

- C. Cables shall be pulled into raceways in accordance with the manufacturer's requirements. Under no circumstances shall cable pulling tensions exceed the manufacturer's written instructions.
- D. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.

## PART 2 - PRODUCTS

### 2.01 CONDUCTORS

- A. General: Conductors, include grounding conductors, shall be stranded copper. Aluminum conductor and/or solid conductor wire and cable will not be permitted. Insulation shall bear the UL label, the manufacturer's trademark, and identify the type, voltage, and conductor size. Conductors except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment such as motors and controllers shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. Wiring shall have wire markers at each end.
- B. Power and Control Conductors, 600 Volts and Below:
  - 1. Solid copper wires shall be 600 volt Type XHHW, sizes #12 and #10 AWG for use with lighting and receptacle circuits only.
  - 2. Stranded copper wire for power circuits shall be 600 volt Type XHHW or RHW, Class B stranding, sizes #12 AWG and larger.
  - 3. Stranded copper wire for control circuits shall be 600 volt Type XHHW or RHW, Class B stranding, size #14 AWG.
  - 4. Control wires inside panels and cabinets shall be machine tool grade type MTW, UL approved, rated for 90 degrees C at dry locations.
  - 5. Fixture wire shall be 600 volt, silicone rubber insulated, 200°C, UL Type SF 2, with stranded copper conductors.
  - 6. Conductors for feeders as defined in Article 100 of the NEC shall be sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.
  - 7. Conductors for branch circuits as defined in Article 100 of the NEC shall be sized to prevent voltage drop exceeding 3 percent at the farthest connected load or combinations of such loads and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.
- C. Tray Cable, 600 volt and Below:
  - 1. Multi-conductor tray cable shall be rated 600 volts, listed by UL as Type TC cable per Article 336 of the NEC. Each cable conductor shall be insulated with XHHW-2 type insulation rated at 600 volts. The individual conductors shall be twisted together and jacketed with a PVC outer covering containing a UL label and necessary identification, including the manufacturer, the number of conductors, size, XHHW-2 insulation, sunlight-resistant and other pertinent information.



2. Conductor sizes shall be the same as for power and control as noted above.
3. Multi-conductor power cables include the following:

<b>Phase Conductor Size (AWG)</b>	<b>Minimum Ground Wire Size (AWG)</b>	<b>No. of Conductors (not incl. Ground)</b>
12	12	2 3
10	10	2 3
8	10	3
6	8	3
4	6	3
2	6	3
1/0	6	3
2/0	4	3
4/0	4	3

4. Multi-conductor control cables include the following:

<b>Conductor Size (AWG)</b>	<b>No. of Conductors (Including 1#14 AWG Ground)</b>
14	3
14	4
14	5
14	7
14	9
14	12
14	19
14	37

## 2.02 SPLICES AND TERMINATIONS OF CONDUCTORS

### A. Splices:

1. Wire and Cable Splicing Materials and Applications:
  - a. For Lighting Systems and Power Outlets: Wire nuts shall be twist-on type insulated connectors utilizing an outer insulating cover and a means for connecting and holding the conductors firmly. They shall be UL listed and suitable for connecting two to four solid copper conductors of #14 or #12 AWG size or two or three #10 AWG solid copper conductors.
  - b. All Equipment: Crimp type connectors shall be insulated type with nylon jacket, suitable for the size and material of the wires and the number of

- wires to be spliced and for use with either solid or stranded conductors. They shall be UL listed.
  - c. Division 16 Equipment and Power Conductors: Bolted pressure connectors shall be suitable for the size and material of the conductors to be spliced. They shall be UL listed and of the split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor.
  - d. All Equipment: Epoxy splice kits shall include epoxy resin, hardener, and mold, and shall be suitable for use in wet locations and hazardous locations.
- B. Terminations:
- 1. Low Voltage Terminations:
    - a. Crimp type terminals shall be UL listed, self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.
    - b. Terminal lugs shall be UL listed and of the split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor. Tongues shall have NEMA standard drilling.
    - c. Crimp with manufacturer recommended ratchet-type tool with calibrated dies. Hand crimping tools are not acceptable.
  - C. Tape used for splices and terminations shall be compatible with the insulation and jacket of the cable and shall be of plastic material. Tape shall conform with UL 510. Varnished cambric, rubber and thermoplastic tape shall be used for all split-bolt terminations.
  - D. Wire markers shall be heat shrink type (Raychem; T&B; or equal). Wire identification numbers shall be permanently imprinted on the markers. In locations which are not practical for heat shrink type labels, such as conduit bodies and small pull boxes, machine-printed, adhesive backed wire markers shall be used. Markers shall be custom-printed with the full identification string. Individual character markers and clip-on wire markers are not acceptable.

## PART 3 - EXECUTION

### 3.01 CONDUCTOR INSTALLATION

- A. The Contractor shall provide, terminate and test all power, control, and instrumentation conductors.
- B. The Contractor shall, as a minimum, provide the number of control wires listed in the conduit schedule or on the Contract Drawings. Excess wires shall be treated as spares for future use.
- C. Conductors shall not be pulled into any raceway until raceway has been cleared of moisture and debris.
- D. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be neatly fanned out to terminals.
- E. Provide the following types and sizes of conductors for the uses indicated for 600 volts or less:

1. Solid Copper, Sizes #12 and #10 AWG: As shown on the Drawings for circuits for receptacles, switches and light fixtures with screw-type terminals.
  2. Stranded Copper, Size #14 AWG and Larger, Individual Conductors or CC: As shown on the Drawings for the control of motors or other equipment. Size #14 shall not be used for power supplies to any equipment.
  3. Stranded Copper, Sizes #12 AWG and Larger: As shown on the drawings for motors and other power circuits.
  4. Stranded Copper, #6 AWG and Larger.
  5. Fixture Wire: For connections to all fixtures in which the temperature may exceed the rating of branch circuit conductors.
- F. Color Coding: All wire shall be coded with specific colors infused in the conductor insulation at the time of manufacture. If a conductor is specified in a gauge not available with integrally colored insulation, it shall be marked by the Contractor at the time of installation using colored electrical coding tape or an approved marking paint. Where tape or paint is used as the conductor identification system, it shall clearly distinguish the conductor over its entire exposed length in all junction boxes, manholes, conduit bodies, or other accessible intermediate locations, and at every termination. All wiring shall conform to the following wiring color code:

SYSTEM	CONDUCTOR	COLOR
120/240 Volt AC, 1-Phase, 3 Wire	Neutral Line 1 Line 2	White Black Red
120/240 Volt AC, 3-Phase, 4 Wire	Neutral Phase A Phase B (high leg) Phase C	White Black Orange Blue
120/208 Volt AC, 3-Phase, 4 Wire	Neutral Phase A Phase B Phase C	White Black Red Blue
277/480 Volt AC, 3-Phase 4 Wire	Neutral Phase A Phase B Phase C	Grey Brown Orange Yellow
All Systems	Earth, System, or Equipment Ground	Green Insulation, Green w/ Yellow Tracer, or Bare Conductor
120 Volt AC Control Power Circuits (In field or in Control Cabinets)	Neutral Line 1 Line 2	White Black Red
120 Volt AC UPS-derived Control Power (secondary side)	Neutral Line	White w/ Red Tracer Red w/ White Tracer
24 VAC Control Power Circuits (In field or in Cabinets)	Neutral Line	White or Grey, with Yellow Tracer Brown
12 or 24 Volt DC Control Wiring (PLC Discrete I/O, etc.)	DC Negative DC Positive DC Switched (DI/DO)	Yellow Orange Blue

SYSTEM	CONDUCTOR	COLOR
120 Volt AC Control Wiring inside or outside cabinets to/from PLC Discrete I/O	Common or Neutral 120 VAC discrete inputs 120 VAC relay or discrete outputs	White or Grey, w/ Blue Tracer Blue Red
Instrumentation Twisted-shielded Cabling (PLC Analog I/O @ 4-20mA, or 1-5 Volt DC, etc.) Process Signals to/from Transmitters, Analyzers, etc.	Negative Polarity Positive Polarity (1st Conductor) Positive Polarity (2nd Conductor) Shield Drain Wire	Black White (or clear)  Red  Bare Conductor, or covered w/ heat-shrink tubing of a unique color
Instrumentation wiring in cabinets (PLC Analog I/O from field terminations of shielded cables).	PLC Analog Input Connections PLC Analog Output Connections	Grey  Brown

- G. Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.
- H. Wrap all cables in manholes with fireproofing tape. Extend tape 1-inch into ducts.
- I. Cable bending radius shall be per applicable code. Install feeder cables in one continuous length unless splices are favorably reviewed.
- J. Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in any flexible conduit or any raceway in which all or any portion of a run consists of non-metallic duct or conduit. For flexible conduit, an external bonding jumper is an acceptable alternative.
- K. In panels, bundle incoming wire and cables, No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.
- L. For cables crossing hinges, utilize extra flexible stranded wire, make up into groups not exceeding 12, and arrange so that they will be protected from chafing and excess flexing when the hinged member is moved.

### 3.02 CONDUCTOR SPLICES AND TERMINATIONS

- A. Splices: Install all conductors without splices unless necessary for installation, as determined by the Engineer. Splices, when permitted, and terminations shall be in accordance with the splice or termination kit manufacturer's instructions. Splice or terminate wire and cable as follows:
  1. Watertight Splices: Splices in concrete pullboxes, for any type of cable or wire, shall be watertight and rated for continuous submergence. Make

splices in low voltage cables using epoxy resin splicing kits rated for application up to 600 volts.

- B. Terminations:
  - 1. Terminate stranded #14 wire using crimp type terminals where not terminated in a box lug type terminal. Terminals must be coordinated with type of terminal board where provided.
  - 2. Excess control wire shall be long enough to terminate at any terminal block in the enclosure, be properly taped, be identified with origin and be neatly coiled.

### 3.03 CONDUCTOR IDENTIFICATION

- A. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule or as favorably reviewed by the Engineer.
- B. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

### 3.04 FIELD TESTS

- A. Refer to Specification 16950 – Electrical Tests for all cable testing requirements.

END OF SECTION

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## SECTION 16160

### PANELBOARD

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Provide panelboards complete and operable, in accordance with the Contract Documents.
- B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

##### 1.02 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI):
  - 1. Z55.1 Gray Finishes for Industrial Apparatus and Equipment
- B. National Electrical Manufacturers Association (NEMA):
  - 1. PB1 Panelboards
  - 2. 250 Enclosures for Electrical Equipment (1,000 Volts Maximum)
- C. Federal Specifications (FS):
  - 1. W-P-115 Panel, Power Distribution
  - 2. W-C-375 Circuit Breakers, Molded Case, Branch Circuit, and Service
- D. Underwriters Laboratories (UL):
  - 1. 50 Enclosures for Electrical Equipment, Non-Environmental Considerations
  - 2. 67 Standard for Panelboards
  - 3. 869A Reference Standard for Service Equipment
  - 4. 1699 Standard for Arc-Fault Circuit-Interrupters
- E. National Fire Protection Association (NFPA):
  - 1. 70 National Electrical Code (NEC)

##### 1.03 SUBMITTALS

- A. Submit material or equipment data in accordance with the Product Review category of the General Conditions and the submittal requirements of Section 16010.
- B. Shop Drawings: For each panelboard, submit manufacturer's name and data as required:
  - 1. Bill of materials.
  - 2. Panelboard enclosure type.
  - 3. Main bus and terminal connection sizes.
  - 4. Main bus configuration
  - 5. Bus materials
  - 6. Location of line connections.
  - 7. Scaled and dimensioned cabinet drawings showing conduit entrance and exit locations.
  - 8. Gutter space.
  - 9. Gauge of boxes and fronts

10. Finish data.
  11. Voltage rating.
  12. Continuous current rating.
  13. Short circuit rating.
  14. Breaker types, trip ratings, and interrupting ratings.
  15. Mounting method.
  16. Circuit breaker layout drawing with dimensions and nameplate designations matching the Drawings.
- C. Submit catalog cuts for panelboard, circuit breakers, protective devices, metering, and any other included accessories.
  - D. Submit time current curves for each circuit breaker type included.
  - E. Submit seismic design certifications and anchorage descriptions.
  - F. Submit field acceptance test results.

#### 1.04 LOCATIONS

- A. Refer to Section 16010 for definitions of types of locations.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Panelboards shall be factory assembled, dead-front units conforming to NEMA PB 1, UL 50, and UL 67. All panelboards shall be UL labeled.
- B. Unless otherwise indicated, provide enclosure types to match the ratings required for the location in which the panelboard is installed, in accordance with Section 16010.
- C. Each panelboard shall have a manufacturer's nameplate showing the voltage, bus rating, phase, frequency and number of wires.
- D. Panelboards, circuit breakers, and all major components installed within shall be the product of a single manufacturer.
- E. The number and arrangement of circuits, spares and blank spaces for future circuit breakers shall be as shown on the Drawings.
- F. Circuit breaker ampere trip ratings shall be as required by the equipment.
- G. Ratings:
  1. Voltage: As shown on the Drawings
  2. Continuous current: As shown on the Drawings
  3. Main circuit breaker: As shown on the Drawings
  4. Short circuit:
    - a. Panelboards rated 240 VAC or less, and not used as a service entrance, shall have short circuit ratings not less than 10,000 amperes RMS symmetrical or as indicated by the Short Circuit Study prepared under Specification 16961, whichever is greater.
    - b. Panelboards shall be labeled with a UL short circuit rating. Series ratings are not acceptable.



## 2.02 PANELBOARDS

- A. Panelboards shall meet the requirements of Federal Specification W-P-115 for Type I, Class 1 panelboards with circuit breakers.
- B. Construction:
  - 1. Busbars shall be tinned copper.
  - 2. All circuit breakers shall be bolt-on type, with 1, 2 or 3 poles, as shown on the Drawings. Breakers shall be quick-make, quick-break, inverse time trip characteristics, to trip free on overload or short circuit. Each breaker shall have a single operating handle which indicates the trip condition of the breaker by its position. Circuit breakers shall meet the requirements of Federal Specification W-C-375.
  - 3. Where GFCI circuit breakers are shown on the Drawings or required by NEC, a unit shall be provided that contains a conventional thermal-magnetic trip and a ground-fault sensor, rated to trip the circuit breaker in approximately 0.025 second for a 5-milliampere ground fault, UL Class A sensitivity. The ground-fault sensor shall have the same rating as the circuit breaker and shall have a push-to-test button.
  - 4. Where AFCI circuit breakers are shown on the Drawings or required by NEC, a unit shall be provided that contains a conventional thermal-magnetic trip and an arc-fault sensor, in accordance with UL 1699. The arc-fault sensor shall have the same rating as the circuit breaker and shall have a push-to-test button.
  - 5. Panelboards shall have hinged doors with combination catch and latch and common keying for locks. The front panels shall be arranged such that when the plates are removed, the gutters, terminals and wiring will be exposed and accessible. The doors shall have inner doors within the plates to have only the breaker operating mechanism exposed when they are opened. Live conductors and terminals shall be concealed behind the plates.
- C. Provide surge protective devices (SPDs) as shown on the Drawings and in accordance with Section 16280.
- D. Manufacturers:
  - 1. 240V and below: Eaton Pow-R-Line 1a/2a, Schneider Electric NQ/NF, or approved equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Panelboards shall be installed as indicated on the Drawings and in accordance with the manufacturer's instructions.
- B. Panelboards shall be mounted with the top of the box 6 feet 6 inches above the floor. Panelboards shall be plumb within 1/8 inch. The highest breaker operating handle shall not be higher than 72 inches above the floor.
- C. Provide neutral-ground bonding at service entrances as shown on the Drawings and as required by the NEC.
- D. Connect ground bus to the existing building grounding electrode system as required by the NEC.

### 3.02 IDENTIFICATION

- A. Provide a nameplate for each panelboard as required by Section 16010.
- B. Provide a typewritten and printed circuit schedule in each panelboard. Handwritten schedules will not be accepted. Circuit schedule shall be placed within a clear pocket affixed to the inside of the hinged panelboard door.

### 3.03 FIELD ACCEPTANCE TESTS

- A. Test per Specification 16950.

END OF SECTION

## SECTION 16280

### SURGE PROTECTIVE DEVICES

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. This Section describes the materials and installation requirements for surge protective devices (SPD). These devices are used to protect AC electrical circuits from the effect of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and or capacitive load switching.

##### 1.02 REFERENCES

- A. Underwriters Laboratories (UL):
  1. 67 – Standards for Panelboards
  2. 845 – Standard for Safety Motor Control Centers
  3. 857 – Standard for Safety Busway
  4. 891 – Standard for Safety Switchboards
  5. 1558 – Standard for Safety Metal Enclosed Low Voltage Switchgear
  6. 1449 Fourth Edition 2016 - Surge Protective Devices (SPD)
  7. 1283 - Electromagnetic Interference Filters
- B. American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE):
  1. C62.41.1-2002 - IEEE Guide on the Surge Environment in Low Voltage (1000 V and Less) AC Power Circuits
  2. C62.41.2-2002 - IEEE Recommended Practice on Characterization of Surge Voltages in Low Voltage AC Power Circuits
  3. C62.45-2002 - IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits
- C. National Fire Protection Association (NFPA):
  1. 70 - National Electrical Code (NEC) Article 285

##### 1.03 SUBMITTALS

- A. Submit surge protective device catalog cut sheets, dimensional data, and shop drawings with the applicable equipment in which the device is installed or to which it is connected.

#### PART 2 - PRODUCTS

##### 2.01 GENERAL

- A. SPD shall be Listed in accordance with UL 1449 Fourth Edition 2016 and UL 1283, Electromagnetic Interference Filters.
- B. SPD shall be Component Recognized in accordance with UL 1449 Fourth Edition, at the standard's highest short circuit current rating (SCCR) of 200 kA.
- C. SPD shall be tested with the ANSI/IEEE Category C High exposure waveform (20kV-1.2/50 s, 10kA-8/20 s).

- D. SPD shall provide suppression for all modes of protection: L-N, L-G, and N-G in WYE systems.
- E. The manufacturer of the SPD shall be the same as the manufacturer of the service entrance and distribution equipment in which the devices are installed and shipped or coordinated with the manufacturer of the panel in which it is installed so as to maintain the proper UL listing.

2.02 SPD RATINGS

- A. Minimum surge current rating shall be 250 kA per phase (100 kA per mode) for service entrance and 120 kA per phase (50 kA per mode) for distribution applications.
- B. UL 1449 voltage protection rating (VPR) must not exceed the following:

VOLTAGE	L-N	L-G	N-G
240/120	700V	700V	700V
208Y/120	700V	700V	700V
480Y/277	1200V	1200V	1200V

- C. Pulse life test: Capable of protecting against and surviving 5000 ANSI/IEEE Category C High transients without failure or degradation of clamping voltage by more than 10%.
- D. SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
- E. SPD shall be constructed using multiple surge current diversion thermally protected metal oxide varistors (TPMOV). The surge current circuit shall be designed and constructed in a manner that ensures surge current sharing.
- F. Visible indication of proper SPD connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable. The status of each SPD module shall be monitored on the front cover of the enclosure as well as on the module.
- G. SPD shall be equipped with an audible alarm which shall activate when any one of the surge current modules has reached an end-of-life condition. An alarm on/off switch shall be provided to silence the alarm. The switches and alarm shall be located on the front cover of the enclosure.
- H. SPD shall be equipped with dry contacts (normally open or normally closed) to allow connection to a remote monitor or other system for the following conditions:
  - 1. End-of-life condition for the complete SPD or module.
  - 2. SPD has operated to protect the equipment from a surge.
- I. Terminals shall be provided for necessary power and ground connections.

2.03 MANUFACTURERS

- A. Eaton SPD, Square D, Surgelogic IMA Series, ASCO Power Technologies (APT), or approved equal.

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

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## SECTION 16920

### MOTOR CONTROL CENTER

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.
- B. Work Included: Provide a motor control center, complete, at the location shown on the Drawings.

##### 1.02 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association (NEMA) Publications:
  - 1. ICS 1 General Standards for Industrial Controls and Systems
  - 2. ICS 2 Standards for Industrial Control Devices, Controllers and Assemblies
  - 3. ICS 4 Terminal Blocks for Industrial Control Equipment and Systems
  - 4. ICS 6 Enclosures for Industrial Controls and Systems
- B. International Electrical Testing Association (NETA) Publication:
  - 1. ATS Acceptance Testing Specifications for Electrical Power and Distribution Equipment and Systems
- C. Underwriters Laboratories (UL) Publication:
  - 1. UL 845 Motor Control Centers

##### 1.03 SUBMITTALS

- A. Shop Drawings shall be custom prepared for this project and shall include the following:
  - 1. Complete materials list stating manufacturer, brand name and catalog number of each item or class of material.
  - 2. For equipment, panels, boxes, control devices, wiring devices, and other uniquely-tagged items as indicated on the Drawings, include the respective tag(s) on each applicable shop drawing and cut sheet.
  - 3. Shop drawings for grounding work not specifically indicated on the drawings but required under the NEC.
  - 4. Front, side and rear elevations along with top views with required dimensional data.
  - 5. Location of conduit entrances and access plates.
  - 6. Catalog cuts defining component data.
  - 7. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size and cable numbers.
  - 8. Method of anchoring, seismic requirements and weight.
  - 9. Types of materials and finish.
  - 10. Nameplates.
  - 11. Temperature limitations, as applicable.
  - 12. Voltage requirements, phase and current, as applicable.
  - 13. Front and rear access requirements.
  - 14. Test reports.
  - 15. A wiring diagram and an elementary control diagram for each unit

16. An overall connection diagram for the motor control center
  17. A dimensioned outline drawing to scale showing space for conduits, etc.
  18. Complete identification of all electrical components in the control center and their interconnections within the motor control center
  19. All connections to external equipment and controls
  20. Bus material and ratings
  21. Wire marking scheme
  22. Where unit arrangement or wiring deviates in any way from that shown on the Drawings, provide a complete record and explanation of such deviations.
- B. Submit a sketch of description of the seismic anchorage system.
- C. Arrange submissions in a logical manner and use the device abbreviation identifications and equipment names as shown on the Drawings, in order to expedite and facilitate review by the Engineer.
- D. Spare Parts List: Submit a spare parts list showing recommended parts and quantities as well as complete ordering information for replacement components. Provide instruction books for special control devices and special equipment installed in the control center. Submit these to the Engineer prior to installation of the equipment.
- E. O&M Manuals and other documentation, shall be submitted in accordance with these contract documents. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc. to instruct operating and maintenance personnel unfamiliar with such equipment. Manuals and documentation shall include the following:
1. A comprehensive index.
  2. A complete "As-built" set of approved shop drawings.
  3. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.
  4. A table listing of the "as left" settings for all timing relays and alarm and trip set points.
  5. System schematic drawings "As-Built", illustrating all components, piping and electrical connections of the system supplied under this Section.
  6. Detailed service, maintenance and operation instructions for each item supplied.
  7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
  8. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
  9. Complete parts list with stock numbers, including spare parts.

#### 1.04 INSPECTIONS

- A. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.
- B. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.



## 1.05 WARRANTY

- A. Contractor shall warrant that all materials and equipment will be new, of good quality, in conformance with the Contract Documents, and free from defective workmanship and materials. Contractor shall warrant that materials or items incorporated into the Work comply with the requirements and standards in the Contract Documents. At Owner's request, Contractor must furnish satisfactory evidence of the quality and type of materials and equipment furnished. Contractor's warranty does not extend to damage caused by normal wear and tear, or improper use or maintenance.
- B. Warranty Period: Contractor's warranty must guarantee its equipment for a period of one year from the date of Project acceptance (the "Warranty Period").
- C. Warranty Documents: Contractor shall supply City with all warranty and guarantee documents relevant to equipment and materials incorporated into the Work and guaranteed by their suppliers or manufacturers.

## PART 2 - PRODUCTS

### 2.01 MOTOR CONTROL CENTER

- A. General: The motor control center shall be a free-standing, completely metal enclosed, dead front, dead rear, grouped motor control center arranged as shown on the Drawings. The motor control center shall be suitable for use on a 120/240-volt, 3 phase, 4 wire system grounded at the supply, with a short circuit capacity of up to 42,000 amperes without a neutral conductor in the motor control center. The motor control center shall conform to all applicable requirements of current NEMA Standards ICS 1 and ICS 2 and be UL listed. Each MCC section shall bear the UL label. Equipment shall be assembled into standardized drawout units. The motor control center shall be NEMA Class II, Type B construction.
- B. Structure and Arrangement:
  - 1. The motor control center[s] shall consist of NEMA 1 vertical free-standing sections, each at least 20 inches wide, 20 inches deep and 90 inches high, and containing not more than six space units. A space unit shall be the space required for a Size 1 combination starter together with associated control transformer. The motor control center shall be suitable for floor mounting against a wall. Provide a horizontal wireway 6 inches high at the bottom of the motor control center, and a vertical wireway 4 inches wide in each 20 inch-wide structure. Coordinate horizontal wireway dimensions with that of the existing housekeeping concrete pad to ensure conformance with the NEC 6'6" rule (NEC 380 8).
  - 2. Each cubicle shall have an individual door with concealed hinges. Doors shall be part of the structure, shall be readily interchangeable, and shall be interlocked so that the unit power is off before the door can be opened; provide door hinges on the side of the cubicle which ensures compliance with the 30 inch rule in NEC Paragraph 110 16(a). In addition, each unit shall be padlockable in the off position and in the tilted-out disconnected position.
  - 3. All components shall be within individual control cubicles, except as noted. Control components shall be as specified in Section 16955.
  - 4. "Future" spaces shall be cubicles arranged for future addition of the door and unit of the size indicated on the Drawings. The vertical bus shall extend to but not be exposed within "future" spaces.

5. Arrangement and grouping of cubicles shall be substantially as shown on the Drawings. Avoid deviations from the arrangement shown, if possible; otherwise, submit changes to the Engineer for review. The number of vertical free-standing sections shown on the Drawings is the maximum number that the available space will accommodate.
- C. Buses:
1. Each motor control section shall have a main 3 phase, 3 wire, horizontal insulated bus rated 600 amperes. Each vertical section shall have a rigid vertical insulated bus rated not less than 300 amperes and extending to all space units; the bus in vertical sections containing either main lugs or main breakers shall have the same ratings as the horizontal bus. Brace buses for 42,000 amperes symmetrical.
  2. Provide the motor control center with a ground bus not smaller than 1/4 square inch in cross sectional area, copper equivalent, extending to all sections. Provide a solderless connector for copper cable at each end of each ground bus, sized for the grounding conductor shown on the Drawings. All solderless connectors shall be NEMA Standard.
  3. All phase and ground buses shall be of copper with silverplated joints and connections, or shall be of aluminum completely tin-plated. If aluminum buses are used, take special precautions at all joints to offset the effects of creep of the aluminum and to minimize effects of contact between dissimilar metals. All terminal lugs shall be suitable for copper conductors.
- D. Wiring:
1. All wiring entirely within the motor control center shall be completely factory installed and shall be thermoplastic machine tool wiring rated 600 volts.
  2. Provide a control terminal block with identified terminals in each cubicle for external control wiring associated with that cubicle. Terminal blocks, in cubicles and on doors, shall be as specified elsewhere herein under Motor Control Units.
  3. Connections of wiring from devices on fixed surfaces to door-mounted devices shall have hinge loops of extra flexible wires securely fastened at each end to permit opening and closing the door without "working" the terminations.
  4. Each control or feeder unit in the motor control sections shall be connected to the vertical bus by means of self-aligning, free-floating, silverplated copper alloy, plug-in pressure stab units. All components shall be mounted on a removable pan secured by quick opening fasteners and aligned by means of guide rails. Units shall be interchangeable.
- E. Motor Control Units:
1. General: Each unit shall consist of a motor circuit protector and a magnetic starter. The combination shall have an interrupting rating of not less than 42,000 amperes symmetrical at 480 volts. Each unit shall have a control terminal board and other components as shown on the Drawings.
  2. Motor circuit protector shall be molded case quick-make, quick-break with magnetic trip only. The motor circuit protector shall be rated 600 volts with adjustable trip settings and interrupting rating of not less than 14,000 RMS symmetrical amperes. The motor circuit protector shall have the rating and trip setting as shown on the Drawings and shall be UL listed. Motor circuit protector shall be Square D MagGard, Eaton HMCP, or equal.
  3. Starter shall be magnetic air-break type complying with NEMA Standards, no smaller than Size 1, each with three ambient compensated type overload

- elements with externally operable manual reset. Overload relays shall have a field adjustable trip of 85% to 115% of heater rating. Size the overload heaters to protect the motor actually installed. For submersible motors, provide fast-acting overload relays if required by the motor manufacturer. Provide two spare auxiliary contacts, one normally open and one normally closed.
4. Control power transformers shall be dry type machine tool transformers. These shall be Hevi-Duty SBE Series, Square D Class 9070, or equal. Sizes shall be as required for the inrush and continuous current requirements of the circuits. Primary windings shall be fused in both phases. Secondaries shall be fused and grounded.
  5. Pushbuttons, selector switches, indicating lights, control relays, elapsed time meters, and timing relays shall be as specified in Section 16955.
  6. Terminal blocks shall be rated 600 volts and at least 30 amps. These shall be either the box lug type or isolating switch type, as required. Any circuit within the unit which can be energized when the unit power is off shall have isolating switch type terminals. Provide terminals for all external connections as shown on the Drawings, and, in addition, at least 15% spare terminals. Permanently identify each terminal with the same number as the wire being terminated. Terminal blocks shall conform to NEMA ICS4 and shall be Buchanan NQO, Square D Class 9080, or equal.
- F. Main, and feeder circuit breakers shall be thermal magnetic and of the size shown on the Drawings. Interrupting rating shall be at least 22,000 amperes symmetrical at 240 volts.
- G. Surge Protection: Provide each motor control center with one 3 phase, 600 volt, 0.5 mfd sloping capacitor and one 3 phase rotating machine lightning arrester rated for 750 volts phase-to-phase, connected to the main bus assembly.
- H. Lighting Panelboard:
1. Provide a lighting panelboard built into the motor control center.
  2. Lighting panelboard shall be as specified in Section 16160.
- I. Nameplates and Identification:
1. Provide the motor control center with manufacturer's nameplate which indicates voltage, phases, number of wires, frequency, and bus ratings.
  2. Provide the motor control center with an identifying nameplate inscribed as shown on the Drawings.
  3. On each cubicle door in the control center, provide an identifying nameplate inscribed as shown on the Drawings.
  4. In those cases where integral legend plates cannot be used, install additional special nameplates on doors to identify selector switches, pushbuttons or other devices, as required by the Drawings or as specified herein. All integral legend plates shall be large size and shall be uniform for all control centers.
  5. Identify all internal wiring using a system consistent with the terminal identification system. Each wire at each terminal shall have attached to it permanent means of identification made of moisture resistant non-fading material.
- J. Motor Winding Heater: Unit shall consist of a solid state electronic chassis mounted SCR module equipped with integral aluminum heat sinks and shall be furnished complete with fuses for SCR overcurrent protection and wiring protection. Additional SCR protection shall be provided in the form of a metal oxide varistor for voltage surges and an RC snubber circuit to limit rate of voltage

change. Solid state logic shall maintain a +2% output voltage regulation for line voltage variations from -15% to +10% while maintaining a controlled current flow in the motor winding when the motor is not running. Unit shall automatically energize when motor starter contacts open and de-energize when motor starter contacts close. Provide corrosion resistant warning labels for attachment to motors stating voltage is present at motor at all times. Unit shall operate a separately supplied indicating light to indicate heater operation and fuses condition. Equipment shall be capable of operating in an ambient temperature range from 5°C to 55°C. Equipment shall be Allen Bradley Bulletin 1410 Catalog 1410 E01, DNH "Digifire," or equal.

- K. Finish: Paint finish shall be ANSI 61 and the dry film thickness shall be not less than 3 mils.
- L. Manufacturer:
  - 1. The motor control center shall be standard catalog equipment modified as shown on the Drawings or specified herein as normally manufactured by the specified manufacturer.
  - 2. The motor control center shall be as manufactured by Schneider, Eaton, Allen Bradley, or equal. All shall be factory assembled, except for shipping splits.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install the motor control center level and plumb, and secure to a 3-inch-high housekeeping concrete pad in conformance with the favorably reviewed seismic mounting method. Doors shall swing freely and close tightly.
- B. Carefully repair any damage to the structure, components or finish to the satisfaction of the Engineer. Clean all nameplates.
- C. Exercise care at all times after installation of motor control center to keep foreign matter, dust, dirt, debris, and moisture out of the control center.
- D. Lase incoming and outgoing power conductors to resist short circuit forces. Follow manufacturer's instructions.

### 3.02 FIELD TEST

- A. Test the motor control center according to Specification 16950 – Electrical Tests

END OF SECTION

## SECTION 16950

### ELECTRICAL TESTS

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK

- A. This Section specifies the work necessary to test, commission, and demonstrate that the electrical system satisfies the requirements of these Specifications and functions as required by the Contract Documents. The work of this Section is applicable to both pre and post energization testing required by the Manufacturer to facilitate sign-off on their respective equipment as well as pre and post energization testing performed by an independent third party entity independent of manufacturers, suppliers and installers of electrical equipment, installations and systems.
- B. The Work shall include furnishing the labor, equipment, and power required to support the testing indicated in other Divisions of these Specifications. Electrical testing indicated herein and functional testing of power and controls, shall be completed for each phase of construction as indicated on the Drawings. This scope may require the Contractor to activate circuits, shutdown circuits, run equipment, make electrical measurements, replace blown fuses, and install temporary jumpers, etc.
- C. Carry out tests indicated herein for individual items of materials and equipment in other Sections. Testing shall be done in accordance with the manufacturer's instructions, these Specifications, and applicable NETA Acceptance Testing Specifications, NEMA, ANSI, NFPA, and ASTM Standards.
- D. Factory Acceptance Testing and other off-site test requirements are included in other Sections.
- E. Corrections and Replacements
  1. Before final acceptance, each part of the work shall be thoroughly tested, and each test shall be documented and submitted in accordance with the Contract Documents.
  2. Any materials or equipment failing any test shall be corrected or replaced as required to pass the test at no additional cost to the Owner.
  3. Any materials or equipment failing any test shall be re-tested after correction or replacement to verify compliance.
  4. Any failures shall again be corrected or replaced, and then re-tested.
  5. The correction/replacement/re-testing cycle shall continue until the item passes the required test(s).

##### 1.02 REFERENCE STANDARDS

- A. Electric equipment, materials, installation, and testing shall comply with the National Electrical Code (NEC), and shall also conform to the following codes and standards:
  1. American National Standards Institute (ANSI)
  2. InterNational Electrical Testing Association (NETA)
  3. Institute of Electrical and Electronics Engineers (IEEE)
  4. Occupational Health and Safety Administration (OSHA)

5. ASTM International Standard E329
6. IEEE 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems
7. IEEE 576, Recommended Practice for Installation, Termination, and Testing of Insulated Power Cable as Used in Industrial and Commercial Applications
8. National Fire Protection Association (NFPA) 70B, NEC for Maintenance
9. Telecommunications Industry Association (TIA) 568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards.

### 1.03 SUBMITTALS

- A. Submit complete system test procedures and test record forms for review. Test procedures shall include but not be limited to:
  1. Detailed procedures, both pre and post energization testing requirements of the Manufacturer and independent third-party entity, in sufficient detail to verify conformance with these Specifications.
  2. Incorporation of data collection and measurement values as shown in the sample test record forms provided at the end of this Section. Submitted test record forms shall include space for each of the fields listed, at a minimum.
  3. Detailed comprehensive testing schedule including:
    - a. Electrical testing of each major area.
    - b. Each major piece of electrical distribution equipment.
    - c. Each major electrical subsystem.
    - d. Duration of each test.
    - e. Milestone test completion date.
    - f. Date of test results submittals following completion of the tests.
    - g. Names and qualifications of the individual(s) responsible for performing the testing, including a copy of current NETA Technician cards.
    - h. Proof of NETA accreditation for the testing agency.
- B. Following completion of the test submit the completed test results to the Engineer for review. The results shall include a dedicated section with the "as-left" settings of all devices, relays, circuit breakers, etc.
- C. Test results shall be submitted in one submittal.
- D. Test reports shall be based on NETA's latest Acceptance Testing Specifications having a sign-off, pass/fail data filed for each line item covered by NETA's Acceptance Testing Specifications latest edition.

### 1.04 QUALITY ASSURANCE

- A. Testing Firm Qualifications:
  1. Corporately and financially independent organization functioning as an unbiased testing authority.
  2. Professionally independent of manufacturers, suppliers, and installers of electrical equipment and systems being tested.
  3. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.
  4. Supervising engineer accredited as Certified Electrical Test Technologist by NICET or NETA and having a minimum of 5 years testing experience on similar projects.
  5. Technicians certified by NICET or NETA.

6. Registered Professional Engineer to provide comprehensive project report outlining services performed, results of such services, recommendations, actions taken, and opinions.
  7. In compliance with OSHA CFR 29, Part 1910.7 criteria for accreditation of testing laboratories or a full member company of NETA.
- B. Test equipment shall have an operating accuracy equal to or greater than requirements established by NETA ATS.
- C. Test instrument calibration shall be in accordance with NETA ATS.

#### 1.05 FIELD TESTS

- A. All testing shall be performed in the presence of the Owner.
- B. Any system material or workmanship that is found to be defective on the basis of acceptance tests shall be reported directly to the Owner.

### PART 2 - PRODUCTS

#### 2.01 PRE-ENERGIZATION AND OPERATING TESTS

- A. The complete electrical system for each phase of construction shall be performance tested when first installed on-site. Each protective, switching, and control circuit shall be adjusted in accordance with the recommendations of the Protective Device Coordination Study required by Section 16961 and tested by actual operation using current injection or equivalent methods as necessary to ensure that each and every such circuit operates correctly to the satisfaction of the Owner.
  1. Instrument Transformers. All instrument transformers shall be tested to verify correct polarity and burden.
  2. Protective Relays. Each protective relay shall be demonstrated to operate by injecting current or voltage, or both, at the associated instrument transformer output terminal and observing that the associated switching and signaling functions occur correctly and in proper time and sequence to accomplish the protective function intended.
  3. Switching Circuits. Each switching circuit shall be observed to operate the associated equipment being switched.
  4. Control and Signal Circuits. Each control or signal circuit shall be observed to perform its proper control function or produce a correct signal output.
  5. Metering Circuits. All metering circuits shall be verified to operate correctly from voltage and current sources, similarly to protective relay circuits.
  6. Acceptance Tests. Complete acceptance tests shall be performed, after the station installation is completed, on all assemblies, equipment, conductors, and control and protective systems, as applicable, to verify the integrity of all the systems.
  7. Relays and Metering Utilizing Phase Differences. All relays and metering that use phase differences for operation shall be verified by measuring phase angles at the relay under actual load conditions after operation commences.
- B. Test Report. A test report covering the results of the tests required in the Pre-Energization and Operating Tests shall be delivered to the Engineer prior to energization. Acceptance Testing shall be in accordance with NETA ATS, *Standard for Acceptance Testing Specifications for Electrical Power Equipment*

*and Systems*, published by the InterNational Electrical Testing Association. Tests shall be provided by both the manufacturer representative and independent third-party NETA accredited testing agency where required.

## 2.02 FIELD TESTS BY MANUFACTURER'S OR SUPPLIERS

A. All field tests shall be performed by the Manufacturers or Suppliers.

## 2.03 TEST REQUIREMENTS

- A. The following test requirements supplement test and acceptance criteria that may be stated elsewhere.
1. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known and reasonable current in the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.
- B. Low Voltage Motor Control Centers
1. Refer to paragraph 2.03D for appropriate inspections and tests of the motor control center circuit breakers.
  2. Refer to paragraph 2.03H for appropriate inspections and tests of the motor control center starters.
  3. Visual and Mechanical Inspection
    - a. Compare equipment nameplate data with drawings and specifications.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage, alignment, grounding, and required area clearances.
    - d. Verify the unit is clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
    - e. Verify that fuse and circuit breaker sizes and types correspond to drawings and coordination study as well as to the circuit breaker's address for microprocessor-communication packages.
    - f. Verify that current and voltage transformer ratios correspond to drawings.
    - g. Verify that wiring connections are tight and that wiring is secure to prevent damage during routine operation of moving parts.
    - h. Inspect bolted electrical connections for high resistance using one or more of the following methods:
      - 1) Use of a low-resistance ohmmeter.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - 3) Perform thermographic survey in accordance with paragraph 2.03N.
    - i. Verify operation and sequencing of interlocking systems.
    - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    - k. Inspect insulators for evidence of physical damage or contaminated surfaces.
    - l. Verify correct barrier and shutter installation and operation.
    - m. Exercise all active components.
    - n. Inspect mechanical indicating devices for correct operation.



- o. Verify that filters are in place and vents are clear.
  - p. Perform visual and mechanical inspection of instrument transformers in accordance with paragraph 2.03E.
  - q. Inspect control power transformers.
    - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
    - 2) Verify that primary and secondary fuse or circuit breaker ratings match drawings.
    - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks
4. Electrical Tests
- a. Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter.
  - b. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with NETA ATS Table 100.1.
  - c. Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it shall be in accordance with NETA ATS Table 100.2. The test voltage shall be applied for one minute.
  - d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable. Test duration shall be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.
  - e. Perform electrical tests on instrument transformers in accordance with paragraph 2.03E.
  - f. Perform ground-resistance tests in accordance with paragraph 2.03G.
  - g. Determine accuracy of all meters and calibrate watt-hour meters in accordance with paragraph 2.03F. Verify multipliers.
  - h. Control Power Transformers
    - 1) Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be in accordance with NETA ATS Table 100.1 unless otherwise specified by the manufacturer.
    - 2) Perform a turns-ratio test on all tap positions.
    - 3) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.
    - 4) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.
    - 5) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.
  - i. Voltage Transformers
    - 1) Perform secondary wiring integrity test. Verify correct potential at all devices.
    - 2) Verify secondary voltages by energizing the primary winding with system voltage.

- j. Perform current-injection tests on the entire current circuit in each section of switchgear:
    - 1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 ampere flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.
    - 2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 ampere flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.
  - k. Perform system function tests in accordance with NETA ATS Section 8.
  - l. Verify operation of cubicle switchgear/switchboard space heaters.
  - m. Perform phasing checks on double-ended or dual-source switchgear to insure correct bus phasing from each source.
5. Test Values – Visual and Mechanical
- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - c. Results of the thermographic survey shall be in accordance with paragraph 2.03N.
6. Test Values – Electrical
- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Insulation-resistance values of bus insulation shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated. Dielectric withstand voltage tests shall not proceed until insulation-resistance levels are raised above minimum values.
  - c. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.
  - d. Minimum insulation-resistance values of control wiring shall not be less than two megohms.
  - e. Results of electrical tests on instrument transformers shall be in accordance with paragraph 2.03E.
  - f. Results of ground-resistance tests shall be in accordance with paragraph 2.03G.
  - g. Accuracy of meters shall be in accordance with paragraph 2.03F.
  - h. Control Power Transformers
    - 1) Insulation-resistance values of control power transformers shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated.
    - 2) Turns-ratio test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio.

- 3) Secondary wiring shall be in accordance with design drawings and specifications.
  - 4) Secondary voltage shall be in accordance with design specifications.
  - 5) Control transfer relays shall perform as designed.
  - i. Voltage transformers
    - 1) Secondary wiring shall be in accordance with design drawings and specifications.
    - 2) Secondary voltage shall be in accordance with design specifications.
  - j. Current-injection tests shall prove current wiring is in accordance with design specifications.
  - k. Results of system function tests shall be in accordance with NETA ATS Section 8.
  - l. Heaters shall be operational.
  - m. Phasing checks shall prove the switchgear or switchboard phasing is correct and in accordance with the system design.
- C. Low Voltage Cables-600 volts Maximum
- 1. Visual and Mechanical Inspection
    - a. Compare cable data with Drawings and Specifications.
    - b. Inspect exposed sections of cables for physical damage and correct connection in accordance with single-line diagram.
    - c. Inspect bolted electrical connections for high resistance using one of the following methods:
      - 1) Use of low-resistance ohmmeter
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - 3) Perform thermographic survey in accordance with paragraph 2.03N.
    - d. Inspect compression-applied connectors for correct cable match and indentation.
    - e. Inspect for correct identification and arrangements.
    - f. Inspect cable jacket insulation and condition.
  - 2. Electrical Tests
    - a. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be 1 minute.
      - 1) Motor feeders tested with motors disconnected and controller open.
      - 2) Motor control circuits tested and verified for proper operation with control stations and overcurrent devices connected.
      - 3) Panelboard feeders tested with feeder breaker open and panelboard connected. If a lighting transformer is associated with the panelboard, it shall be connected and the test made for both primary and secondary sides.
      - 4) Conductors of main lighting feeders, including lighting panel with branch circuits open.
      - 5) Prior to performing insulation resistance tests on cables, verify that they are not connected to a solid state device.

- 6) Equipment which may be damaged during this test shall be disconnected.
  - 7) The Engineer shall be consulted if minimum insulation values cannot be obtained.
  - b. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable.
  - c. Perform continuity test to ensure correct cable connection.
  - d. Perform the following industry-standard operational and performance tests on each Category 6 Ethernet cable as detailed in ANSI/EIA-568-C:
    - 1) Wire map (pass/fail)
    - 2) Propagation delay (pass/fail)
    - 3) Delay skew (pass/fail)
    - 4) Cable length
    - 5) Insertion loss (attenuation)
    - 6) Return loss (pass/fail)
    - 7) Near-end crosstalk (NEXT) (pass/fail)
    - 8) Power sum near-end crosstalk (PSNEXT) (pass/fail)
    - 9) Equal level far-end crosstalk (ELFEXT)
    - 10) Power sum equal level far-end crosstalk (PSELFEXT).
  - 3. Test Values - Visual and Mechanical
    - a. Compare bolted connection resistance to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - b. Bolt-torque levels shall be in accordance with NETA ATS Table 100.12 unless otherwise specified by the manufacturer.
    - c. Results of the thermographic survey shall be in accordance with paragraph 2.03N.
  - 4. Test Values - Electrical
    - a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - b. Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations shall be investigated.
    - c. Cable shall exhibit continuity.
    - d. Deviations in resistance between parallel conductors shall be investigated.
    - e. Compare Category 6 Ethernet test values against TIA 568-C for determination of pass/fail status.
- D. Molded and Insulated Case Circuit Breakers
- 1. Visual and Mechanical Inspection
    - a. Compare equipment nameplate data with drawings and specifications.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage and alignment.
    - d. Verify the unit is clean.
    - e. Operate the circuit breaker to insure smooth operation.
    - f. Inspect bolted electrical connections for high resistance using one or more of the following methods:
      - 1) Use of a low-resistance ohmmeter.

- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12
- 3) Perform thermographic survey in accordance with paragraph 2.03N.
- g. Inspect operating mechanism, contacts, and arc chutes in unsealed units.
- h. Perform adjustments for final protective device settings in accordance with the coordination study.
- 2. Electrical Tests
  - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
  - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to ground with the circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1.
  - c. Perform a contact/pole-resistance test.
  - d. Determine long-time pickup and delay by primary current injection.
  - e. Determine short-time pickup and delay by primary current injection.
  - f. Determine ground-fault pickup and time delay by primary current injection.
  - g. Determine instantaneous pickup by primary current injection.
  - h. Test functions of the trip unit by means of secondary injection.
  - i. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data.
  - j. Verify correct operation of auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, anti-pump function, and trip unit battery condition. Reset all trip logs and indicators
  - k. Verify operation of charging mechanism.
- 3. Test Values – Visual and Mechanical
  - a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - c. Results of the thermographic survey shall be in accordance with paragraph 2.03N.
  - d. Settings shall comply with coordination study recommendations.
- 4. Test Values – Electrical
  - a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated.
  - c. Microohm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's published data is not available, investigate values that

deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.

- d. Insulation-resistance values of control wiring shall not be less than two megohms.
- e. Long-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times shall not exceed the value shown in NETA ATS Table 100.7.
- f. Short-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.
- g. Ground fault pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.
- h. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances. In the absence of manufacturer's published data, refer to NETA ATS Table 100.8.
- i. Pickup values and trip characteristics shall be within manufacturer's published tolerances.
- j. Minimum pickup voltage of the shunt trip and close coils shall conform to the manufacturer's published data. In the absence of the manufacturer's published data, refer to NETA ATS Table 100.20.
- k. Breaker open, close, trip, trip-free, anti-pump, and auxiliary features shall function as designed.
- l. The charging mechanism shall operate in accordance with manufacturer's published data.

#### E. Instrument Transformers

- 1. Visual and Mechanical inspection
  - a. Compare equipment nameplate data with drawings and specifications.
  - b. Inspect physical and mechanical condition.
  - c. Verify correct connection of transformers with system requirements.
  - d. Verify that adequate clearances exist between primary and secondary circuit wiring.
  - e. Verify the unit is clean.
  - f. Inspect bolted electrical connections for high resistance using one or more of the following methods:
    - 1) Use of a low-resistance ohmmeter.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12
    - 3) Perform thermographic survey in accordance with paragraph 2.03N.
  - g. Verify that all required grounding and shorting connections provide contact.
  - h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
  - i. Verify correct primary and secondary fuse sizes for voltage transformers.
  - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests – Current Transformers
  - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
  - b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 volts dc for one minute. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations.
  - c. Perform a polarity test of each current transformer in accordance with ANSI/IEEE C57.13.1.
  - d. Perform a ratio-verification test using the voltage or current method in accordance with ANSI/IEEE C57.13.1.
  - e. Perform an excitation test on transformers used for relaying applications in accordance with ANSI/IEEE C57.13.1.
  - f. Measure current circuit burdens at transformer terminals in accordance with ANSI/IEEE C57.13.1.
  - g. When applicable, perform insulation-resistance tests on the primary winding with the secondary grounded. Test voltages shall be in accordance with NETA ATS Table 100.5.
  - h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages shall be in accordance with NETA ATS Table 100.9.
  - i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
  - j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with ANSI/IEEE C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.
3. Electrical Tests – Voltage Transformers
  - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
  - b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Test voltages shall be applied for one minute in accordance with NETA ATS Table 100.5. For units with solid state components that cannot tolerate the applied voltage, follow manufacturer's recommendations.
  - c. Perform a polarity test on each transformer to verify the polarity marks or H1- X1 relationship as applicable.
  - d. Perform a turns-ratio test on all tap positions.
  - e. Measure voltage circuit burdens at transformer terminals.
  - f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage shall be in accordance with NETA ATS Table 100.9. The test voltage shall be applied for one minute.
  - g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
  - h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with ANSI/IEEE C57.13.3. The grounding point should be located as specified by the engineer in the project drawings.
4. Test Values – Visual and Mechanical

- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - c. Results of the thermographic survey shall be in accordance with paragraph 2.03N.
5. Test Values – Current Transformers
- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Insulation-resistance values of instrument transformers shall not be less than values shown in NETA ATS Table 100.5.
  - c. Polarity results shall agree with transformer markings.
  - d. Ratio errors shall be in accordance with C57.13.
  - e. Excitation results shall match the curve supplied by the manufacturer or be in accordance with ANSI C57.13.1.
  - f. Measured burdens shall be compared to instrument transformer ratings.
  - g. Insulation-resistance values of instrument transformers shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.5.
  - h. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary winding is considered to have passed the test.
  - i. Power-factor or dissipation-factor values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.
  - j. Test results shall indicate that the circuits have only one grounding point.
6. Test Values – Voltage Transformers
- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Insulation-resistance values of instrument transformers shall not be less than values shown in NETA ATS Table 100.5.
  - c. Polarity results shall agree with transformer markings.
  - d. Ratio errors shall be in accordance with C57.13.
  - e. Measured burdens shall be compared to instrument transformer ratings.
  - f. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.
  - g. Power-factor or dissipation-factor values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.
  - h. Test results shall indicate that the circuits are grounded at only one point.

F. Metering Devices

- 1. Visual and Mechanical Inspection
  - a. Compare equipment nameplate data with drawings and specifications.
  - b. Inspect meters and cases for physical damage.



- c. Clean front panel and remove shipping restraint material.
  - d. Verify tightness of electrical connections.
  - e. Record model number, serial number, firmware revision, software revision, and rated control voltage.
  - f. Verify operation of display and indicating devices.
  - g. Record passwords.
  - h. Verify unit is grounded in accordance with manufacturer's instructions.
  - i. Verify unit is connected in accordance with manufacturer's instructions and project drawings.
  - j. Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements.
- 2. Electrical Tests
    - a. Apply voltage or current as appropriate to each analog input and verify correct measurement and indication.
    - b. Confirm correct operation and setting of each auxiliary input/output feature including mechanical relay, digital, and analog.
    - c. After initial system energization, confirm measurements and indications are consistent with loads present.
  - 3. Test Values – Visual and Mechanical
    - a. Nameplate data shall be per drawings and specifications.
    - b. Tightness of electrical connections shall assure a low resistance connection.
    - c. Display and indicating devices shall operate per manufacturer's published data.
  - 4. Test Values – Electrical
    - a. Measurement and indication of applied values of voltage and current shall be within manufacturer's published tolerances for accuracy.
    - b. All auxiliary input/output features shall operate per settings and manufacturer's published data.
    - c. Measurements and indications shall be consistent with energized system loads.
- G. Grounding System
- 1. Visual and Mechanical Inspection
    - a. Verify ground system is in compliance with drawings, specifications, and NFPA 70 National Electrical Code Article 250.
    - b. Inspect physical and mechanical condition.
    - c. Inspect bolted electrical connections for high resistance using one or more of the following methods:
      - 1) Use of low-resistance ohmmeter.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
    - d. Inspect anchorage.
  - 2. Electrical Tests
    - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
    - b. Perform fall-of-potential or alternative test in accordance with ANSI/IEEE 81 on the main grounding electrode or system.

- c. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points.
  - 3. Test Values – Visual and Mechanical
    - a. Grounding system electrical and mechanical connections shall be free of corrosion.
    - b. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - c. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - 4. Test Values – Electrical
    - a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - b. The resistance between the main grounding electrode and ground shall be no greater than five ohms for large commercial or industrial systems and one ohm or less for generating or transmission station grounds unless otherwise specified by the owner. (Reference ANSI/IEEE Standard 142)
    - c. Investigate point-to-point resistance values that exceed 0.5 ohm.
- H. Low Voltage Motor Starters
  - 1. Visual and Mechanical Inspection
    - a. Compare equipment nameplate data with drawings and specifications.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage, alignment, and grounding.
    - d. Verify the unit is clean.
    - e. Inspect contactors.
      - 1) Verify mechanical operation.
      - 2) Verify contact gap, wipe, alignment, and pressure are in accordance with manufacturer's published data.
    - f. Inspect bolted electrical connections for high resistance using one or more of the following methods:
      - 1) Use of a low-resistance ohmmeter.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12
      - 3) Perform thermographic survey in accordance with paragraph 2.03N.
    - g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
  - 2. Electrical Tests
    - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
    - b. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with starter closed, and across each open pole for one minute. Test voltage shall be in accordance with manufacturer's published data or NETA ATS Table 100.5.
    - c. Perform insulation-resistance tests on all control wiring with respect to ground. Applied potential shall be 500 volts dc for 300-volt rated cable

- and 1000 volts dc for 600-volt rated cable. Test duration shall be one minute. For units with solid-state components, follow manufacturer's recommendation.
- d. Test motor protection devices in accordance with manufacturer's published data.
  - e. Test circuit breakers in accordance with paragraph 2.03D.
  - f. Perform operational tests by initiating control devices.
3. Test Values – Visual and Mechanical
- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - c. Results of the thermographic survey shall be in accordance with paragraph 2.03N.
4. Test Values – Electrical
- a. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - b. Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.5. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated.
  - c. Insulation-resistance values of control wiring shall not be less than two megohms.
  - d. Motor protection parameters shall be in accordance with manufacturer's published data.
  - e. Circuit breaker test results shall be in accordance with paragraph 2.03D.
  - f. Control devices shall perform in accordance with system design requirements.
- I. Test ground fault interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle manufacturer.
- J. A functional test and check of electrical components is required prior to performing subsystem testing and commissioning. Compartments and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:
- 1. Visual and physical check of cables, circuit breakers, transformers, and connections associated with each item of new and modified equipment.
  - 2. Verification that electrical equipment has been labeled with Arc Flash protection boundary and PPE levels, as required by Section 16961.
  - 3. Setting of protective relays in conformance with results of the Short Circuit Study required by Section 16961 and testing of relays to assure that relays will trip at the current value and time required by the Study.
  - 4. Circuit Breakers:
    - a. Circuit breakers that have adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field-adjusted by a representative of the circuit breaker manufacturer.

- b. Time and pickup setting shall correspond to the recommendations of the Short Circuit Study.
  - c. Setting shall be tabulated and proven for each circuit breaker in its installed position.
  - d. Test results shall be certified by the person performing the tests and shall be submitted to the Engineer.
- K. Subsystem testing for each phase of construction shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the Owner and after process control devices have been adjusted as accurately as possible. Alarm conditions shall be simulated for each alarm point, and alarm indicators shall be checked for proper operation. It is intended that the Contractor will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.
- L. Subsystems shall be defined as individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.
- M. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.
- N. Thermographic Survey:
  - 1. Visual and Mechanical Inspection:
    - a. Inspect physical, electrical, and mechanical condition.
    - b. Remove all necessary covers prior to thermographic inspection. Utilize appropriate caution, safety devices, and personal protective equipment.
  - 2. Equipment to be inspected shall include all 120-volt and higher current-carrying devices including all switchgear, switchboards, distribution panels, cable and bus connections, motor control centers and starters, disconnect switches, and other critical equipment. Testing of lighting luminaires, field instrumentation, SCADA & PLC's are not required.
  - 3. Provide report including the following:
    - a. Description of equipment to be tested.
    - b. Discrepancies.
    - c. Temperature difference between the area of concern and the reference area.
    - d. Probable cause of temperature difference.
    - e. Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.
    - f. Identify load conditions at time of inspection.
    - g. Provide photographs and/or thermograms of the deficient area.
    - h. Recommended action.
  - 4. Test Parameters:
    - a. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1°C at 30°C.
    - b. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
    - c. Thermographic surveys shall be performed during periods of maximum possible loading but not less than 40 percent of rated load of the

electrical equipment being inspected. Refer to NFPA 70B, Section 11-17 (Infrared Inspection).

5. Test Values:
    - a. Suggested actions based on temperature rise can be found in Table 100.18 as shown below. The Contractor shall investigate and make repairs as recommended in Table 100.18.
  6. Re-Inspection:
    - a. All items that are reported deficient in the thermography reports section of the inspection report shall be re-inspected after repairs have been made.
    - b. Original specification will apply to re-inspections.
    - c. Submit re-inspection reports and indicate that repairs have fixed the anomaly or indicate any remaining anomalies.
- O. Voltage Field Test:
1. Check and record voltage after the installation is essentially complete and has been made operational.
  2. Check and record voltage amplitude and balance between phases for loaded and unloaded conditions.
  3. Unbalance Corrections:
    - a. Notify the Owner if balance (as defined by NEMA) exceeds 1%, or if voltage varies throughout the day and from loaded to unloaded condition more than plus or minus 4% of nominal.
  4. Voltage Balance Report:
    - a. Submit Voltage Balance Report for each switchboard, distribution panel-board, load center, motor control center, and transformer.
- P. Equipment Line Current Tests:
1. Check and record line current in each phase for each major piece of electrically-operated equipment.
  2. If any phase current for any piece of equipment is above rated nameplate current, prepare a supplement to the Equipment Line Current Report that identifies any causes of problems and corrective action that was taken.
  3. Submit Equipment Line Current Report for each point of connection to motors, transformers, branch circuit distribution connections, and incoming utility service connection.

## 2.04 TEST REPORTS

- A. The test report shall include the following:
1. Summary of project.
  2. Description of equipment tested.
  3. Description of test.
  4. Test data.
  5. Analysis and recommendations.
- B. Test data records shall include the following minimum requirements:
1. Identification of the testing organization.
  2. Equipment identification.
  3. Humidity, temperature, and other atmospheric conditions that may affect the results of the tests/calibrations.
  4. Date of inspections, tests, maintenance, and/or calibrations.
  5. Identification of the testing technician.

6. Indication of inspections, tests, maintenance, and/or calibrations to be performed and recorded.
  7. Indication of expected results when calibrations are to be performed.
  8. Indication of "as-found" and "as-left" results.
  9. Sufficient spaces to allow all results and comments to be indicated.
- C. The Contractor shall submit the complete report to the Engineer for review.

**TABLE 100.18**

**THERMOGRAPHIC SURVEY  
SUGGESTED ACTIONS BASED ON TEMPERATURE RISE  
(AS PER PARAGRAPH 2.03N)**

<b>Temperature difference (<math>\Delta T</math>) based on comparisons between similar components under similar loading.</b>	<b>Temperature difference (<math>\Delta T</math>) based upon comparisons between component and ambient air temperatures.</b>	<b>Recommended Action</b>
1°C - 3°C	1°C - 10°C	Possible deficiency; warrants investigation
4°C - 15°C	11°C - 20°C	Indicates probable deficiency; repair as time permits
- - - - -	21°C - 40°C	Monitor until corrective measures can be accomplished
>15°C	>40°C	Major discrepancy; repair immediately

**Table 100.18 Notes**

1. Temperature specifications vary depending on the exact type of equipment. Even in the same class of equipment (i.e., cables) there are various temperature ratings. Heating is generally related to the square of the current; therefore, the load current will have a major impact on  $\Delta T$ . In the absence of consensus standards for  $\Delta T$ , the values in this table will provide reasonable guidelines.
2. An alternative method of evaluation is the standards-based temperature rating system as discussed in Chapter 8.9.2, Conducting an IR Thermographic Inspection, Electrical Power Systems Maintenance and Testing, by Paul Gill, PE, 1998.
3. It is a necessary and valid requirement that the person performing the electrical inspection be thoroughly trained and experienced concerning the apparatus and systems being evaluated, as well as knowledgeable of thermographic methodology.

**PART 3 - EXECUTION**

**3.01 FIELD TESTS**

- A. The Contractor shall provide ten Working Days' notice to the Owner prior to any field testing to permit witnessing of the testing.

## TEST RECORD SHEETS

The test record sheets listed below are provided as an example to demonstrate the minimum requirements to be included on test record sheets for electrical equipment and of the electrical installation as required by these specifications. Sample copies of each sheet are attached.

Sheet No.	Title
1	Insulation Resistance (Power, Control Wire, and Cable) Test Record
2	Insulation Resistance (Instrument Wire and Cable) Test Record
3	Bonding Resistance Readings (Electrical Equipment) Test Record
4	Thermographic Inspection Test Record







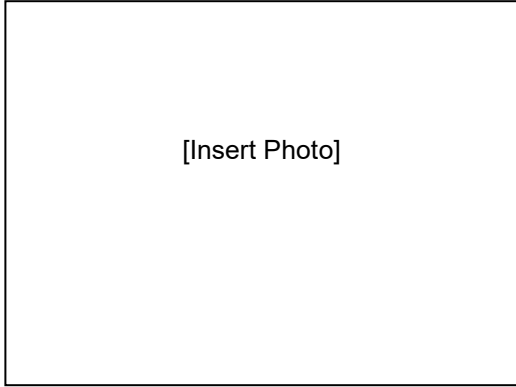


**THERMOGRAPHIC INSPECTION TEST RECORD**

TEST EQUIPMENT: \_\_\_\_\_ CALIBRATION DATE: \_\_\_\_\_

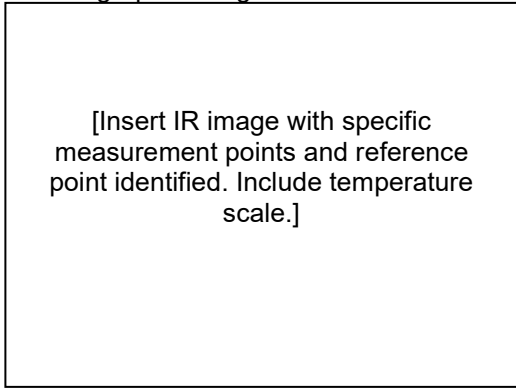
AMBIENT TEMPERATURE: \_\_\_\_\_ °C \_\_\_\_\_ °F DATE: \_\_\_\_\_

**Photo and Identification**



Location	
Equipment ID	
Mfr/Model	
Connected Load	
Actual Load	
Fault (if applicable)	
Recommendation	
Load Factor	

**Thermographic Image and Results**



Max Temp Point ID: _____	_____ deg C
Ref Temp Point ID: _____	_____ deg C
Ref Temp Point ID: _____	_____ deg C
Ref Temp Point ID: _____	_____ deg C
Temperature Difference	_____ deg C
Load-Corrected Temp Rise	_____ deg C

	Current Rating	Measured Current	Measured Voltage	Voltage Drop Across Connection
Phase A				
Phase B				
Phase C				

**Analysis and Recommended Action:**

DISTRIBUTION:

CONTRACTOR/Date \_\_\_\_\_

END OF SECTION

SECTION 16955  
CONTROL DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.
- B. Work Included: Furnish and install all control devices complete, including, as applicable, enclosures, engraved escutcheons or nameplates, gaskets, lenses, lamps and mounting provisions.

1.02 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association (NEMA) Publications:
  - 1. ICS1 General Standards for Industrial Controls and Systems
  - 2. ICS2 Standards for Industrial Control Devices, Controllers and Assemblies
  - 3. ICS6 Enclosures for Industrial Controls and Systems

1.03 SUBMITTALS

- A. Submit material or equipment data in accordance with the Product Review category of the General Conditions and the submittal requirements of Section 16010.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All control devices shall conform to applicable provisions of NEMA Standards ICS1 and ICS2.

2.02 CONTROL AND TIMER RELAYS

- A. General: Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits. Relays shall be of the following types (abbreviations in parentheses correspond to labels on the Drawings):
  - 1. Relays (CR):
    - a. Provide machine tool relays for the following applications:
      - 1) All relays driving 120 Vac motor starters up to and including Size 3.
      - 2) All relays driving non-motor loads up to 6 amps (or 720 VA).
    - b. Provide machine tool type relays with convertible contacts rated 10 amperes continuous with NEMA Rating Designation A600 for ac applications and N600 for dc applications. Coils shall be designed for continuous duty and shall have the voltage rating indicated on the Drawings.
    - c. Relays shall be the magnetically held type unless designated otherwise on the Drawings. For each relay provide one spare Form C contact

- over and above the number indicated on the Drawings. In addition, for latching relays, provide coil clearing contacts as necessary.
- d. Manufacturer: Square D, Class 8501, Type X; General Electric CR120B; or equal.
2. Timing Relays (TD):
    - a. General: Relays designated TD shall be general purpose plug-in time delay relays.
    - c. Time Delay Relays (TD): Relay shall be solid-state with multi-range programmable settings. The relays shall include a calibrated front dial and LED indicator and shall be complete with socket. Relays shall be "on delay" or "off delay" type as indicated on the Drawings. Provide an additional form C contacts over and above the number indicated on the Drawings. Relay contacts shall be rated 10 amp, 120 Vac. Relays shall be ATC Type 328; Idec Type RTEL; or equal.
  3. General Requirements:
    - a. Provide relays rated for 1 million operations at 10 amp, 120 Vac, at power factor of 0.2.
    - b. Where timing relays are interfaced to motor starters or adjustable speed motor controllers, provide auxiliary machine-tool relays or Size 0 magnetic contactors. Refer to previous specifications for machine-tool relays and Size 0 magnetic contactors.
    - c. Where timing relays or control relays require additional contacts, provide auxiliary control relays, properly sized for the application as described previously in this Section.

#### 2.11 ELAPSED TIME METERS (ETM)

- A. Elapsed time meters shall be of the synchronous motor-driven type having a minimum of six (6) decimal digits where the least significant digit shall represent tenths (1/10ths) of hours. Unless specified otherwise, they shall not be equipped with a reset button. They shall be for panel mounting with a square bezel approximately 2-1/2 inches on a side. Meter voltage shall be not more than 120 Vac for meters mounted in instrumentation panels. Elapsed time meters shall be ATC 5702; Yokogawa/General Electric Series 200; Type 240; or equal.

#### 2.12 CONTROL PANEL ACCESSORIES

- A. Relays, timers and other internally mounted equipment shall be of the types specified in other sections of these Specifications.
- B. Panel face mounted equipment shall be of the types specified in other sections of these Specifications.
- C. Standards: All control devices shall conform to applicable provisions of NEMA Standards ICS 1 and ICS 2.
- D. Pushbuttons, Selector Switches and Pilot Lights:
  1. Shall be heavy-duty oiltight units; each unit shall have an engraved escutcheon plate unless nameplates are indicated on the Drawings or are necessary because of length of identification. Pushbuttons and selector switches shall have contacts rated 10 amperes continuous, Rating Designation A600 in conformance with NEMA ICS 2.
  2. Pushbuttons used as emergency stop devices shall have a padlockable means for maintaining an open circuit. Indicating lights shall be push-to-test transformer type with lenses of the colors shown on the Drawings.

- E. Multiposition control switches shall have rotary action, round knurled handle and the number of positions and stages shown on the Drawings. They shall be suitable for panel mounting. Each position shall have a positive detent. Contacts shall have a continuous current rating of 10 amperes at 300 Vac. Switches shall have integral indicator.
- F. For 4-20 mAdc and 1 to 5 Vdc signal selector switches, provide oiltight selector switches with electronic duty gold contact blocks. Provide sliding contacts for reliable operation without benefit of thermal cleaning action.
- G. Manufacturer: Provide Microswitch heavy-duty oiltight manual controls, Type PT, with electronic duty gold contact blocks; Allen-Bradley Bulletin 800T oiltight selector switch with stackable "Logic-Reed" contact blocks; or equal.
- H. Colors and Descriptions:
  1. Indicating Lamps: Unless otherwise noted on the Drawings, the following color code and inscriptions shall be followed for the lenses of all indicating lights.

Indicating Lamp Inscription	Color
ON/START	Green
OFF/STOP	Red
CLOSED	Red
LOW	Amber
FAIL	Red
HIGH	Amber
OPEN	Green
POWER ON	White
RESET	Red
AUTO	Blue

2. Lettering shall be black on white and amber lenses. Lettering shall be white on red and green lenses.
  3. Pushbuttons: Follow color coding for indicating lamp above.
  4. All unused or noninscribed buttons shall be black. Lettering shall be black on white and yellow buttons. Lettering shall be white on black, red and green buttons.
- J. Nameplates: Unless specified otherwise in the Drawings, nameplates shall be black lamacoid with minimum 3/16-inch-high white letters for major area titles, 5/32-inch for component titles, and 1/8-inch for subtitles, and shall be fastened with a permanent but dissolvable adhesive or by screws.

## 2.13 WATT AND VAR TRANSDUCERS

- A. The transducers shall provide 4-20 mAdc output signals proportional to ac power input in watts or volt-ampere reactive (VAR). The units shall be capable of driving into a load of 750 ohms. The calibrated power range shall be as shown on the Drawing.
- B. The units shall use all electronic design. Ambient temperature change influence shall be less than 0.5% over a range of -5° to 165°F. The units shall not drift more

than  $\pm 0.25\%$  per year. Accuracy shall be  $\pm 0.2\%$  of full scale. Response time shall be less than 400 mS. The units shall be capable of operating with a power factor of unity to lead or lag zero.

- C. Units shall be capable of meeting surge withstand criteria ANSI C37.90.1-1989 (IEEE SWC). Units shall be self-powered from the input circuit unless noted otherwise.
- D. The number of phases, voltage level, current level, and number of wires shall be as required. The unit shall be enclosed in a NEMA 12 steel enclosure with mounting plate.
- E. Unit shall be Rochester Instrument Systems Series PCE for watt and Series VCE for VAR transmitters; Crompton Industries; or equal.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Identify all control devices with engraved plastic nameplates or escutcheons, as applicable. Install control devices as recommended by the manufacturer.

END OF SECTION



## SECTION 16961

### POWER SYSTEM STUDIES

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.

##### 1.02 SCOPE OF WORK

- A. Obtain the services of an independent firm to provide complete Short-Circuit and Protective Device Coordination studies, and Arc Flash Risk Assessment for the electrical system as defined below. The firm performing the work shall have been regularly engaged in short-circuit and protective device coordination services for a period of at least 10 years.
- B. The firm performing the work shall be responsible for the collection of all data required to perform the studies, including the electrical utility company's short-circuit current contribution.
- C. For the purpose of this specification Section, the "Electrical System" shall be defined as the entire power distribution system, including the existing main service disconnect down through the main circuit breaker on the 240/120VAC panelboard. Some equipment not modified as part of this contract is required to be included in the studies defined in this Section. Items within the "Electrical System" are comprised of:
  - 1. Existing main service entrance switchboard
  - 2. New motor control center
  - 3. Existing Filter Pump Variable Frequency Drives
  - 4. New 120/240V lighting panelboard.
  - 5. All branch circuits fed from lighting panelboard.
- D. The Short-Circuit Study shall provide for the calculation of fault currents at each piece of gear in the Electrical System for the entire Site. Fault currents shall be calculated for scenarios of utility and standby power, as outlined in this Section.
- E. The Protective Device Coordination Study shall include trip characteristics for all protective devices in the Site Electrical System, from the utility company's main service disconnect through the main circuit breaker on the 240/120 VAC panelboard. Trip characteristics shall be analyzed for scenarios of utility and standby power, as outlined in this Section.
- F. The Arc Flash Risk Assessment shall provide for arc flash incident energy calculations at all panels as required by IEEE 1584 (2018 Edition) and NFPA 70E.
- G. Reports:
  - 1. Reports for the Short-Circuit Study, Protective Device Coordination Study, and Arc Flash Risk Assessment shall be stamped and signed by a California Registered Electrical Engineer.
  - 2. Report calculations shall be generated by a software analysis application with proven accuracy and reliability at performing 3-phase fault calculations.

### 1.03 REFERENCE STANDARDS

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
- B. American National Standards Institute (ANSI)
- C. The National Fire Protection Association (NFPA)
- D. InterNational Electrical Testing Association (NETA) Standard for Acceptance Testing Specifications (ATS)
- E. NFPA 70E, Standard for Electrical Safety in the Workplace
- F. IEEE 1584 (2018 Edition), Guide for Performing Arc-Flash Hazard Calculations
- G. Occupational Safety and Health Administration (OSHA) (29 CFR PART 1910), Occupational Safety and Health Standards for General Industry

### 1.04 SUBMITTALS

- A. Submit data in accordance with the Product Review category of the General Conditions and the submittal requirements of Section 16010.
- B. Submit credentials of firm performing the studies to demonstrate sufficient experience with performing this type of work, as specified herein.
- C. Preliminary: Preliminary Short-Circuit Study, Protective Device Coordination Study, and Arc Flash Risk Assessment shall be submitted to the Engineer for review prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.
- D. Results of the Short-Circuit Study, Protective Device Coordination Study, and Arc Flash Risk Assessment shall be summarized in a final report. Submit hardbound copies of the complete final report and one digital copy in PDF on a CD. Electronic delivery shall contain full searchable text, and include any computer models developed for the studies at no additional cost.
- E. Sample arc flash warning labels for each piece of equipment. Submit copies of labels at full size, with all required information as calculated by the Arc Flash Risk Assessment.

### 1.05 DATA COLLECTION

- A. The firm performing the Short-Circuit Study, Protective Device Coordination Study, and Arc Flash Risk Assessment shall furnish the Contractor with a listing of required data. The Contractor shall collect and furnish all required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final acceptance of the equipment shop drawings and/or prior to the release of the equipment for manufacturing.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 GENERAL REQUIREMENTS

- A. The Short-Circuit Study and Protective Device Coordination Study shall be performed as outlined in InterNational Electrical Testing Association (NETA) Standard for Acceptance Testing Specifications, Section 6 with exceptions as included in this Section.
- B. In order to select relays and fuse characteristics as required for optimum coordination, the coordination study shall be performed as soon as the vendors for the new electrical equipment are identified. Relays and fuse selection by the power distribution equipment suppliers shall be based on the results of the favorably reviewed study.
- C. The studies shall be submitted to the Engineer for acceptance before final acceptance of power distribution equipment submittals and before any settings are made on equipment.
- D. The final report for the Short-Circuit Study, Protective Device Coordination Study, and Arc Flash Risk Assessment shall be bound in a standard 8 1/2-inch by 11 inch sized report. The selection of all protective relay types, current transformers, and fuse types and ratings shall be the responsibility of the manufacturer and shall be based on the preliminary draft of the coordination study, which shall be submitted with the equipment shop drawings (or earlier). The studies shall be accepted by the Engineer before any equipment is shipped. See Paragraph 1.04 for submittal requirements.
- E. The report shall include a single line diagram depicting the entire Electrical System included in the analysis. At a minimum, the single line diagram shall be on an 11-inch by 17-inch sheet, and include the following information:
  - 1. Equipment/bus tags which match the contract documents
  - 2. Equipment/bus ampacity ratings
  - 3. Motor horsepower
  - 4. Protective device frame rating, trip setting, and curve options, as applicable
  - 5. Transformer primary/secondary voltages, kVA rating, and impedance
  - 6. Conductor materials, insulation types, and lengths

### 3.02 SHORT-CIRCUIT STUDY

- A. Provide a complete Short-Circuit Study. The study shall include, but shall not be limited to, the following, as applicable:
  - 1. Full compliance with applicable ANSI and IEEE Standards.
  - 2. Performed on nationally recognized computer software, such as ETAP or SKM Power Tools.
  - 3. Overall system impedance diagram. The diagram shall include the power company's impedance and X/R ratios and circuit element impedances (e.g., transformers, generators, motors, VFDs, feeders, distribution buses as applicable).
  - 4. Available three phase and ground fault asymmetrical and symmetrical short-circuit fault currents at each piece of electrical equipment, bus, transformer, etc.
  - 5. The momentary and interrupting rating of all elements of the distribution system shall be listed. The maximum available short-circuit fault current available at each element shall be calculated.

6. Executive summary describing the distribution system, the procedures used to develop the study, utility related information furnished by the utility company, including the name and telephone number of the individual supplying the information, identification of all assumptions made in the preparation of the study, identification of any problem areas, and a definitive statement concerning the adequacy of the distribution system to interrupt and withstand the maximum possible short-circuit fault current.
7. Computer printouts for the three phase, single phase and ground fault studies. Printouts shall indicate the short-circuit fault current available at each major equipment and distribution bus within the medium and low voltage distribution systems.

### 3.03 PROTECTIVE DEVICE COORDINATION STUDY

- A. Provide a complete Protective Device Coordination Study. The Protective Device Coordination Study shall include, but shall not be limited to:
  1. Utility protective devices.
  2. Service entrance and distribution switchgear.
  3. Medium and low voltage power system transformers.
  4. Low voltage switchgear, switchboards, power distribution panels and motor control centers.
  5. Power factor correction and harmonic mitigation equipment.
  6. Motor starters and variable frequency drives.
  7. Standby generators.
  8. A tabulation of all the settings for every over current protective device, timer, power system relays (e.g., ANSI 50, 51), circuit breaker, recommended fuse and current transformer ratings, etc.
  9. Transformer excitation current.
  10. Motor and cable damage curves in accordance with the manufacturer's recommendations.
  11. Select relay types (e.g., inverse, very inverse, extremely inverse, overcurrent with or without voltage restraint, timers), current transformer ratings and types, fuse, residually or zero sequence connected ground faults protection, etc. that will allow the system to be protected within the equipment fault ratings and provide the maximum possible coordination between the protective devices.
  12. Provide recommended settings for protective devices, such as relays and circuit breakers, to achieve the best selectivity to minimize system disturbances during fault clearing.
  13. Provide a complete set of time-current coordination curves on log-log paper for every protective relay, circuit breaker, fuse, timer, etc. serving or located in the electrical equipment furnished for the project, including the utility protective devices. Provide a separate time-current curve for each unique feeder system, without displaying parallel devices powered from a common bus. The time-current curves shall display the coordination from the lowest device in the distribution system up through the utility's protective device. Clearly identify each device curve displayed on the graph, by color coding and text callouts. Include specific settings used for the curve (as applicable) in the text callout. A single line diagram depicting the portion of the distribution system under study shall appear with each curve. The minimum size log paper to be submitted shall be 11-inch by 17-inch.
  14. Time current curves shall include transformer ANSI damage and inrush curves, cable damage curves, circuit breaker and fuse ratings and settings,

protective relay settings, and any other information required by ANSI and good design practices. As a minimum, provide curves for:

- a. Each medium voltage and low voltage feeder down to 480-volt motor control centers and panelboards.
  - b. Each main, tie and feeder circuit breakers located in medium voltage and low voltage switchgear, motor control centers and panelboard. Include the largest feeder circuit breaker in each motor control center and panelboard.
  - c. Each ground fault protective device provided for the medium voltage and low voltage power distribution systems.
- B. The report shall include a reference to any part of the Electrical System where selectivity cannot be achieved, and a brief explanation of the cause. Provide recommendations where applicable for alternate methods that would improve selectivity.

### 3.04 ARC FLASH RISK ASSESSMENT

- A. Provide a detailed Arc Flash Risk Assessment. The analysis shall include, but shall not be limited to:
1. Determine potential arc flash incident energies, arc flash boundaries, shock hazard boundaries and proper personal protection equipment (PPE) for all energized electrical equipment.
  2. The study shall determine worst-case scenarios for the arc flash energy level calculations, and any suggested changes to the protection scheme or equipment selection that will result in improved system reliability and safety.
  3. Provide values in tabular format including at a minimum, location of fault, incident energy, arc flash boundary, working distance, acting protective device, protective device activation time, and arcing fault current.
  4. Provide executive summary, including introduction, methodology, information sources, key assumptions, NFPA 70E considerations and calculations.
  5. Develop and install arc flash warning labels based on arc flash study results.

### 3.05 FIELD ADJUSTMENT

- A. All field adjustment and modifications shall be performed in the presence of the Owner, before energizing equipment.
- B. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments shall be completed by the equipment manufacturer.
- C. Make minor modifications to equipment as required to accomplish conformance with Short-Circuit and Protective Device Coordination studies.

### 3.06 MODIFICATIONS

- A. Notify the Owner in writing of any required major equipment modifications. Major modifications to the equipment shall not be allowed unless otherwise approved in writing by the Engineer and the Owner.

### 3.07 ARC FLASH WARNING LABELS

- A. The vendor shall provide a 4 inch by 4 inch thermal transfer type label of high adhesion polyester for each work location analyzed. Labels shall be machine printed, with no field markings.

- B. The label shall have an orange header, compliant with ANSI Z535, with the wording, "WARNING, SHOCK & ARC FLASH HAZARD", and shall include the following information:
1. Location designation (equipment identification tag)
  2. Nominal voltage
  3. Arc flash boundary
  4. Incident energy at working distance (in calories/centimeter-squared)
  5. Working distance
  6. Shock boundaries
    - a. Limited approach distance
    - b. Restricted approach distance
  7. Required personal protective equipment,
  8. Engineering report number, revision number and issue date.
  9. Where voltage exceeds 600 VAC or incident energy is greater than 40 cal/cm<sup>2</sup>, label header shall be changed to "DANGER, SHOCK & ARC FLASH HAZARD."
- C. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
1. For each low voltage motor control center, one arc flash label shall be provided.
  2. Where equipment includes a "maintenance mode" bypass setting on a protective device as a temporary arc-flash reduction measure, provide one arc flash label at the applicable protective device which indicates the calculated values when maintenance mode is enabled. This label shall be clearly marked to indicate what it represents.
- D. The Contractor shall affix the labels in accordance with the following:
1. Labels shall be in a clearly visible location on the front panel of the equipment near the incoming service or main protective device. Labels on equipment with bottom-entry incoming service shall be placed a minimum of 60-inches from the bottom of the equipment.
  2. Labels affixed to outdoor equipment which includes an outer door and inner deadfront panel shall be placed on the deadfront panel to avoid fading due to exposure to the elements.
  3. For labels affixed to removable compartment doors or covers, the removable cover shall be clearly marked to identify the specific compartment for which it is intended to be used.

### 3.08 ARC FLASH TRAINING

- A. The equipment manufacturer shall provide arc flash training to the Owner's staff. At a minimum, the training shall include potential arc flash hazards associated with working on energized equipment and maintenance procedures in accordance with the requirements of NFPA 70E, Standard For Electrical Safety Requirements For Employee Workplaces. The training shall be recorded in a video format and provided on a DVD or solid-state media to the Owner.

END OF SECTION